ANALYTICAL RESULTS REPORT
COLLEGE OF THE CANYONS SMELTER SITE
CANON CITY, COLORADO
TDD #T08-9410-014

Prepared for:

U.S. Environmental Protection Agency
Region VIII, Denver, Colorado
Mike Zimmerman, On-Scene Coordinator
Pat Smith, Site Assessment Manager

Prepared by:

Ecology and Environment, Inc.
Technical Assistance Team
D'Arcy Straub, Project Manager
Mike Sullivan, Project Manager

Date Submitted: December 28, 1994

DRAFT

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

TABLE OF CONTENTS (continued)

LIST OF TABLES (continued)

LIST OF APPENDICES

ANALYTICAL RESULTS REPORT
COLLEGE OF THE CANYONS SMELTER SITE
CANON CITY, COLORADO
TDD #T08-9410-014

1.0 INTRODUCTION

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendment and Reauthorization Act of 1986 (SARA), and in response to Region VIII U.S. Environmental Protection Agency (EPA) Technical Direction Documents (TDD) #T08-9406-008 and #T08-9410-014, the Ecology and Environment, Inc., (E & E) Technical Assistance Team (TAT) was tasked to perform a site inspection at the College of the Canyons Smelter site, CERCLIS ID # COD116263781, located near Canon City, Colorado.

This Analytical Results Report (ARR) was prepared to partially fulfill the requirements of the referenced TDDs. From August 15 through August 31, 1994, a site inspection was conducted at the College of the Canyons Smelter Site in Canon City, Colorado. The site inspection was conducted pursuant to the Sampling QA/QC Work Plan approved by the EPA on August 12, 1994. A Sampling Activities Report (SAR) detailing the activities of the site inspection was submitted on October 10, 1994. This ARR provides the analytical results for the samples collected during the site inspection and subsequently described in the SAR.

2.0 OBJECTIVES

Air, water, soil, and sediment samples were collected at the College of the Canyons Smelter site to accomplish two objectives:

- to obtain the essential data needed to rank the site using the Hazard Ranking System (HRS) by characterizing the waste source and the pathways by which the waste has traveled if a release from the waste source has occurred; and
- to determine if threats to human health or impacts to the environment exist at the site. This objective will be accomplished through characterization of the waste source and pathways in combination with target population information.

High volume air sampling (hi-vol) was used to measure the metal content of suspended particles in the air, thus confirming whether or not metals were being released to the air pathway from the waste source. TAT members Sullivan and Straub conducted the hi-vol sampling from August 16 to August 19, 1994, and from August 23 to August 25, 1994. Samples collected during this event for analysis of ICP metals using QA level II, were delivered to CKY Laboratories in Wheat Ridge, Colorado on August 22 and 26, 1994. Soil samples were collected to characterize the waste source, and sediment samples were collected to characterize the migration of contaminants from the waste source via the water pathway. Soil and sediment samples for field screening and HRS scoring were collected by TAT members Alexander and Mayer from August 23 to August 25, 1994. On August 31, Alexander and Sullivan collected sediment samples. The field screening samples were analyzed by a TN Technologies Spectrace 9000 XRF spectrometer. The HRS samples were delivered to CKY Laboratories on September 13, 1994, for cyanide and/or Hazardous Substance List (HSL) metals using QA level II criteria.

Surface water samples were collected to determine if releases from the waste source were entering the Arkansas River. There are three ditches carrying run-off from the site. These ditches join Forked Gulch at a point north of the site. Forked Gulch then continues to flow north approximately 1 mile, where it enters the Arkansas River (Figure 7). Sampling along the water pathway was conducted by TAT members Alexander and Sullivan on August 31, 1994. The samples were delivered to CKY Laboratories on September 13, 1994, for HSL metals analysis using QA level II criteria.

3.0 SITE DESCRIPTION

3.1 Site Location and History

The College of the Canyons Smelter site encompasses approximately 60 acres and is located 1.5 miles south of the Arkansas River in Canon City, Colorado. The waste on the site consists of tailings, dirt, and slag that contain high levels of metals. The coordinates of the smelter stack, which remains standing, are 38° 24' 43" North latitude and 105° 14' 58" West longitude. The legal site description is the northwest quarter of Section 8, Township 19 South, Range 70 West (Figure 1).

3.2 Background Information and History

The College of the Canyons Smelter Site operated under the direction of the New Jersey Zinc Company. The smelter processed ore particularly rich in zinc and lead that was obtained from the Eagle Mine and Mill in Gilman, Colorado. The smelter operated from 1902 to 1968, and was capable of processing 90 tons of ore per day. After the smelter closed in 1968, the site was purchased by the Canon City Chemical Company, which used the mineral-rich tailings as a soil additive. The operations of the chemical company continued until 1991.

In May 1991, the Emergency Response Branch (ERB) of the EPA removed 155 drums from the site because of potential threats to the environment. At that time, the EPA did not address contaminated soils, waste rock, and tailings from smelter activities. In June 1994, the EPA-ERB and the TAT performed a reconnaissance survey of the smelter site, which included X-ray fluorescence analyses of 17 soil samples. In a majority of the samples collected from on-site soils and waste piles, analyses revealed elevated levels of several metals, including cadmium, lead, mercury, and zinc.

4.0 FIELD ACTIVITIES

4.1 Sample Collection and Field Observations

4.1.1 Air Sampling

TAT members Sullivan and Straub conducted the hi-vol air sampling. Eight hi-vol stations were established to determine a possible release via the air pathway (Figure 2). Five of the eight hi-vol stations were within a zero to 1/4-mile radius of the site. Three of the stations were located north of the site. Two of these stations were placed side-by-side to obtain duplicate samples for QA/QC. The remaining stations within a 1/4 mile radius were located at the College of the Canyons Campus and the Fremont County Business Development Complex. Three hi-vol stations were located at businesses or operations within a 1/4- to 1/2-mile radius of the site. These businesses or operations were the Colorado State Forest Service Shops, Fremont Auto Salvage, and the BFH Transfer Station.

The initial step in the operation of the high-volume air samplers (hi-vols) was calibration of the units with a calibrated variable flow orifice. Once calibrated, air flow through the units could be adjusted or calculated based on a manometer reading. Because accurate measurement of the meteorological conditions is important in the calibration and adjustment of hi-vol units, a portable meteorological (met) station, capable of measuring temperature, humidity, barometric pressure, and wind direction and speed, was erected on site. The meteorological station is capable of continuous readings that can be stored and downloaded to a computer at a later time.

The hi-vol units were operated for five 24-hour periods, during which they drew 50 cubic feet of air per minute (cfm). On August 19, 1994, after the third 24-hour period, operations were suspended due to a heavy rain storm that caused street flooding in Canon City. Had hi-vol operations continued, results would have shown a drastically reduced number of suspended particles in the air for the next 24 to 48 hours. Air sampling resumed on August 23, 1994, and concluded on August 25, 1994, thus completing the five 24-hour sampling periods.

The suspended particles collected were drawn into the hi-vol unit and trapped by Whatman 41 cellulose 8" x 10" filters. To ensure that the filters were not cross-contaminated, dedicated gloves were used to install and remove the filters, and each filter was stored in a dedicated envelope. Manometer readings were taken at the beginning and end of each sampling period. Before a new sampling period was started, the hi-vol units were decontaminated with a damp cloth to remove particles from the previous sampling period. The hi-vol units were also secured to prevent them from being opened, which would potentially contaminate the filters.

A sampling period was defined as 24 hours; consequently, five filters were used in and collected from each of the eight hi-vol stations over the course of the 5-day sampling period. The sampling filters were delivered to CKY for ICP metals analysis. Table 1 contains additional information about air sampling activities.

4.1.2 Soil Sampling

From August 23 to August 25, 1994, fifty-five soil samples were collected by TAT members Alexander and Mayer (Figure 3). Sampling was biased, but a sufficiently large number of samples was collected to ensure a dependable representation of the site. All soil samples were collected with dedicated teflon scoops and were placed into plastic bags which were then secured with tape. The sealed sample bags were placed in a cooler with ice for sample preservation.

Of the 55 soil samples, 10 were split and subsequently delivered to CKY Laboratories for HSL metals analysis using QA level II criteria. Figure 4 illustrates the locations from which the split samples were collected. The 10 samples selected for metals analysis were pre-screened by a TN Technology XRF Lead Analyzer, which is capable of analyzing for iron, copper, zinc, lead, arsenic, and manganese. The samples selected for analysis contained a broad spectrum of metal concentrations.

Most of the soil samples were surface samples, although five samples (CC-XRF-041 through CC-XRF-045) were collected by a hand auger from a depth of 18" below ground surface (bgs). Four of these samples were split and delivered to CKY Laboratories for HSL metals and cyanide analyses using QA level II criteria. These four samples and their corresponding splits were as follows: CC-XRF-41 (CC-SO-10); CC-XRF-42 (CC-SO-11); CC-XRF-43 (CC-SO-12); and CC-XRF-45 (CC-SO-13).

In addition to laboratory analyses, all soil samples were analyzed for 21 metals with the Spectrace 9000 XRF spectrometer. The analyses were conducted under QA Level I screening criteria.

The types of soil samples collected can be categorized into three groups:

- those obtained from tailings, obvious because of their dark red, grayish, or orange color;
- those collected from around building foundations, such as in the area believed to be the location of the assay office; and
- those obtained from locations where the soil appeared to be normal, or uncontaminated.

The uncontaminated soil samples served as background samples CC-XRF-030 (CC-SO-01) and CC-XRF-029 (CC-SO-02). The sample number in parentheses is the number of the sample that was obtained through splitting and was sent to a laboratory for QA level II analysis. Table 1 contains additional information about soil samples.

4.1.3 Sediment Sampling

Thirty sediment samples were collected on August 31, 1994, by TAT members Alexander and Sullivan (Figure 5). Three ditches carrying run-off from the site join Forked Gulch just north of the site; Forked Gulch then continues north to the Arkansas River. From an area just north of the site to the Arkansas River, Forked Gulch is a potential wetlands area.

Samples were obtained from the three on-site ditches, from Forked Gulch, and from the Arkansas River. Sample CC-XRF-112 (CC-SE-16), collected upstream in the Arkansas River, serves as a background sample. Samples CC-XRF-137 (CC-SE-01) and CC-XRF-139 (CC-SE-02) were collected upstream of the site from two of the three ditches. These samples also serve as background samples.

The procedures by which the sediments were collected and selected for analysis were identical to those used for the soil sampling procedures. Of the 30 sediment samples, 16 were split (Figure 6) and selected for HSL metals and cyanide analyses using QA Level II criteria at CKY laboratories. In addition to the QA level II analyses, the 30 samples were analyzed for 21 metals using QA level I criteria with the Spectrace 9000 XRF spectrometer.

Four additional sediment samples (CC-XRF-101 through CC-XRF-104) were collected by TAT members Alexander and Mayer from August 23 to August 25, 1994. These samples were collected from on-site locations where evidence of standing water existed. These samples were analyzed by the Spectrace 9000 XRF spectrometer under QA level I criteria. Table 1 contains additional information about sediment samples.

4.1.4 Surface Water Sampling

The majority of surface water samples were collected by TAT members Alexander and Sullivan concurrent with rainfall on August 31, 1994. Sample collection began at the Arkansas River and continued upstream into the drainage ditch to just north of Valley Road (Figure 7). TAT members Alexander and Mayer collected water samples CC-SW-18 and CC-SW-19 on August 23 and 25, 1994, respectively. These two samples were collected from standing puddles of water outside the drainage ditches. Surface water sample CC-SW-02, collected upstream in the Arkansas River, served as the background sample.

The pH of the surface water samples was field screened with pH paper. Samples CC-SW-16 through CC-SW-19 possessed a relatively acidic pH of 2. Samples CC-SW-12 and CC-SW-13 were mildly acidic with a pH of 6, and the remaining samples exhibited a pH of 7.

The 19 surface water samples were collected in 1-liter polyethylene containers, preserved to pH 2 with nitric acid, and stored on ice. The samples were then delivered to CKY Laboratories where they were analyzed for HSL metals using QA level II criteria. Table 1 contains additional information about surface water samples.

4.1.5 Surveying

A surveying station was established at the northwest corner of section 8. The coordinates of all soil samples and the hi-vol stations on or near the site were obtained with the surveying station. Because of time restrictions and the distance over which the sediment and surface water samples were obtained, coordinates for these sample locations were not obtained, but the approximate location of these samples were plotted on an aerial photograph of the site. In addition to sample locations, site structures and site topographic features were also surveyed to enable creation of a site drawing; however, the site boundaries indicated on each sampling map are approximate.

4.1.6 Non-Sampling Data Collection

It is unlikely that drinking water near the site has been contaminated by the site. Although applications and permits for wells near the site exist, only one well, located approximately

3/4 of a mile north/northeast of the site, is hydrologically downgradient from the site. Because of the availability of municipal water, it is unlikely that ground water is used for drinking water within 2 miles of the site.

There are no residences within 1/2 mile of the site. There are, however, several businesses. Businesses support 40 to 55 workers within 1/4 mile of the site, and 175 to 220 workers within 1/2 mile of the site. There are few residences within a 1-mile radius of the site. Much of Canon City is contained within a 4-mile radius of the site. As many as 12,000 to 15,000 people, based on population densities of Canon City, Lincoln Park, and Brookside, reside within a 1/2-mile to 4-mile radius of the site.

4.1.7 Field Observations

The site served as an smelter/ore processing plant. There are numerous tailing piles on the site, which are easily recognized by their dark red, orange, and/or gray colors. Pyrite crystals are abundant on the site, which is indicative of and consistent with the low pH of the standing water. The sulfur in the pyrite is oxidized to sulfuric acid, consequently lowering the pH of the water. The surface of the tailings is hard and crusty when dry. Although the wind was blowing during sampling periods, it did not appear to create a significant amount of dust.

In accordance with criteria outlined in the Code of Federal Regulations, Forked Gulch may be considered a wetland. Wetlands are comprised of areas saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. During a walk-through of Forked Gulch on August 25, 1994, TAT members Alexander and Mayer observed water seeping into Forked Gulch. Water was observed seeping from the points where samples CC-SW-13 and CC-SW-14 were taken to the Arkansas River. The amount of seeping water generally increased as Forked Gulch continued north toward the Arkansas River. Because substantial precipitation had not fallen in the previous 48 hours, it can be reasonably concluded that the area near Forked Gulch is saturated with ground water. This conclusion is further supported by the types of vegetation growing near Forked Gulch. As illustrated in several on-site photographs, the most obvious sign of soil saturated with water are the phreatophytic cottonwood trees.

4.2 Quality Assurance/Quality Control

Quality assurance/quality control was maintained in accordance with the *Emergency Response Branch Quality Assurance Plan*. Where dedicated equipment was not used to collect samples, TAT maintained the integrity of the samples by following extensive decontamination procedures. The sample containers used during this investigation included 1-liter polyethylene bottles for the surface water samples and small plastic bags or glass jars for the soil and sediment samples. The cellulose filters used for the air sampling were stored in dedicated envelopes. The surface water samples were preserved with nitric acid. Upon completion of a sampling event, samples were sealed in their container, labeled, and sample information was recorded in one of the site log books.

Duplicate and spiked sample analyses were conducted with each of the sample delivery groups. The results of these analyses are contained in the data validation reports (Appendix C). The background samples were compared with the data produced from sample analysis of potentially contaminated locations. Sample CC-SW-02, obtained upstream in the Arkansas River, is the background samples for the surface water samples. Sample CC-SE-02 is the background sample for most of the soil and sediment samples and was obtained from a drainage ditch upstream from the site. The other sample used for sediment background levels was CC-SE-16, which was obtained from upstream in the Arkansas River. CC-SE-02 was used for background levels because the samples originally planned to be used as the soil background samples were more contaminated than anticipated. The background samples for the air sampling varied on a daily basis and were determined based on the predominant wind direction over the previous 24-hour sampling period.

After collection, all samples were handled by rigidly following chain-of-custody protocol prescribed by the *NEIC Procedures Manual for the Evidence Audit of Enforcement Investigations by Contractor Evidence Audit Teams*, April, 1984 and *NEIC Procedures Manual for the Contract Evidence Audit and Litigation Support for EPA Enforcement Case Development*, February, 1989.

5.0 WASTE/SOURCE CHARACTERISTICS

5.1 Waste/Source Description

The College of the Canyons Smelter site consists of approximately 60 acres of land. The waste consists of tailings distributed randomly over the site. Based on field observations and historical data, the tailings are expected to have elevated levels of various metals, and in particular, lead and zinc. The Eagle Mine, from which the ore was transported, is also known to have a high sulfur content, which was substantiated by the presence of pyrite in the tailings.

5.2 Sample Locations

To characterize the waste, soil samples were collected extensively over the site. Fifty-five soil samples were collected, 50 of which were surface samples, and five of which were subsurface samples taken from a depth of 18 inches bgs. As Figure 3 shows, samples were collected from tailing piles, near building structures, and in areas that appeared to be uncontaminated. Samples CC-SO-01 (CC-XRF-030) and CC-SO-02 (CC-XRF-029) were collected as background samples, but analyses of these samples indicated unnaturally high levels of metals. Consequently, sample CC-SE-02, which was collected from a drainage ditch near the site, was used to establish the background levels for the waste source soil samples.

5.3 Analytical Results

There are two sets of analytical results for the soil samples collected. The first set of results consists of the screening data obtained via the Spectrace XRF instrument, while the second set of results consists of the data obtained from the laboratory under QA level II criteria. The XRF results are presented in Table 5 and Appendix E, and the laboratory confirmation results are presented in Table 3. Appendix E provides the XRF raw data, and Table 5 gives the results for zinc and lead.

To determine the precision and accuracy of the XRF analyses, a statistical analysis was conducted (accuracy represents how close the average value of all the measurements

comes to the true value, while precision represents how close in value all of the measurements are to each other). In calculating the percent recoveries presented in Table 7, the laboratory analysis was assumed to be the true value. The statistics presented in Table 8 are categorized into different level ranges to reflect instrument behavior; the XRF is expected to produce measurements with greater accuracy over certain ranges. For instance, the percent recovery of lead from 100 to 1,000 parts per million (ppm) and from 1,000 to 10,000 ppm were 81% and 69%, respectively. Thus, the analyses of lead from 100 to 1,000 ppm are more accurate.

The precision of the analyses can be judged from the standard deviation values. From the standard deviation, the analyses for lead above the level of 10,000 ppm are judged to be the most precise. The standard deviation can also be used to give confidence intervals. The first confidence interval (i.e., ± the standard deviation from the average) represents the 68.3% confidence interval. In other words, 68.3% of all the XRF measurements for lead in the range of 1,000 to 10,000 ppm can be expected to have percent recoveries between 52% and 86%. The second confidence interval (i.e., ± two times the standard deviation from the average) represents the 95.4% confidence interval. Thus, 95.4% of the measurements for lead in the range of 1,000 to 10,000 ppm can be expected to have percent recoveries between 35% and 103%.

The bias of the samples (i.e., high or low) can be corrected by using the value given in the multiplier column in Table 8. Lead values that were greater than 10,000 ppm only had an average percent recovery of 54%, which is indicative of a low bias on the XRF measurements. To gain a value that may better reflect the true value, any XRF lead result over 10,000 ppm can be multiplied by 1.85 to *estimate* the true value of lead in the soil. For instance, the XRF analysis of sample CC-XRF-025 yielded a result of 12,000 ppm. Based upon the low bias indicated by the confirmation samples, the true level of lead in CC-XRF-025 is expected to be closer to 22,000 ppm (12,000 x 1.85 = 22,200).

The analyses (both laboratory and XRF) indicate extensive levels of lead in the soil on the site. The background level of lead for the site was established for the laboratory samples by sample CC-SE-02 at a level of 11 ppm and for the XRF samples by sample CC-XRF-139 at 78 ppm. If contamination is considered to have occurred when levels are observed to be three times above the background level, then all 14 of the laboratory samples and all

55 of the XRF samples indicate the presence of contamination. Typical contamination levels of lead are on the order of 5,000 to 10,000 ppm, while the highest level of contamination observed was approximately 100,000 ppm (10%).

Similar results were obtained for zinc. Using samples CC-SE-02 and CC-XRF-139 as background samples, zinc background levels of 14 and 86 ppm, were obtained, respectively. All 14 laboratory samples and all 55 XRF samples were subsequently found to contain more than three times the background level of zinc. Typical zinc levels were commonly greater than 1,000 ppm. A few samples exceeded 10,000 ppm.

The contamination from cadmium and arsenic is extensive, but not of as large a magnitude as lead or zinc. The XRF measurements of cadmium, and in particular arsenic, are not as reliable as they are for lead and zinc. Consequently, only the laboratory samples were used to characterize the waste source. Using CC-SE-02 as the background sample, the background levels of arsenic and cadmium were found to be 0.9 and 1.1 ppm, respectively. All 14 laboratory samples indicated contamination levels for both cadmium and arsenic. Levels for arsenic and cadmium were typically less than 200 ppm, but both elements had samples in which their levels eclipsed 1,000 ppm.

For mercury, because all results lie at the detection level of the XRF instrument, the XRF results are unreliable. The laboratory analyses, with CC-SE-02 as the background sample, indicate the presence of mercury in 13 of the 14 samples. Levels of mercury were usually below 1 ppm; the highest levels observed were 3.4 ppm and 4.8 ppm.

Due to the nature of the source, other elements occur at elevated levels in some samples. These elements include antimony, manganese, vanadium, cobalt, copper, nickel, and chromium. The extent to which these elements occur, however, is limited, although several samples do indicate substantial contamination at levels greater than 1,000 ppm. Metals occurring at levels exceeding 1,000 ppm are manganese (CC-SO-07, CC-SO-10, CC-SO-11, CC-SO-12, and CC-SO-13), copper (CC-SO-06, CC-SO-09, CC-SO-10, and CC-SO-11) and nickel (CC-SO-06 and CC-SO-09).

Subsurface samples CC-XRF-041 through CC-XRF-045 were taken from a depth of 18 inches bgs. The four laboratory splits were samples CC-SO-10 through CC-SO-13. The

subsurface samples are not noticeably distinguishable from the surface samples. Nearly all the metals previously mentioned as being present at contamination levels in the surface samples are also present at contamination levels in at least one of the four subsurface samples. The only metal present at less than three times the background level in all of the subsurface samples is chromium.

5.4 Conclusions

The waste source can be described as consisting of various heavy metals. Because the tailings are unevenly distributed over the site, a wide variation in levels of metals is observed. Of all the metals, lead is of the greatest concern because of its toxicology and the consistent extent to which it has contaminated the site at relatively high levels. Cadmium, arsenic, and mercury are of toxicological concern and are also present, but not to the same extent and at the level of magnitude as lead. Two elements, iron and zinc, are present at relatively high levels, but are not of toxicological interest. Several other elements (antimony, copper, cobalt, manganese, nickel, and chromium) are occasionally present at elevated levels, but usually at relatively low levels.

6.0 GROUND WATER PATHWAY

6.1 Hydrogeology

Three general types of geologic formations underlie the College of the Canyons Smelter site. The uppermost formation consists of quaternary alluvium, which possesses a hydraulic conductivity near 0.01 cm/sec. The quaternary alluvium is underlain by several sandstone formations, each with a hydraulic conductivity of approximately 10^{-4} cm/sec. Pierre Shale, with a hydraulic conductivity of 10^{-6} cm/sec, underlies the alluvial and sandstone formations. The topography of the area dips slightly to the north, and it is expected that shallow ground water flows to the north from the site and towards the Arkansas River.

6.2 Targets

There are two targets at or near the site that are associated with ground water: wells used for domestic drinking water and a wetlands area north of the site along Forked Gulch. Due to the availability of municipal drinking water in the areas north, south, and east of the site, domestic wells do not represent a viable target. The second target, the wetlands, lies between the site and the Arkansas River. Water was observed to have been seeping from the ground along various spots of Forked Gulch. Any water seeping from the ground is potentially ground water that is transporting contaminants from the site. Due to the ground water seeping into Forked Gulch, and mixing with surface water, determining whether the ground water is contaminated without well water analysis would be difficult.

6.3 Analytical Results

Samples from ground water wells were not obtained.

6.4 Conclusions

Ground water samples were not collected for two reasons. First, the only domestic well that could be affected by ground water contamination has not been used since 1985 (as stated by the owner). The second reason ground water was not sampled is that the ground water is believed to be shallow and moving in a predominantly horizontal direction due to the sloping topography of the area. The topography slopes to the north/northeast and towards Forked Gulch and the Arkansas River. Shallow groundwater moving in a predominantly horizontal direction is consistent with the observation of ground water seeping into Forked Gulch.

7.0 SURFACE WATER PATHWAY

7.1 Hydrology

The College of the Canyons Smelter site is located approximately 1.5 miles south of the Arkansas River. Surface run-off from the site can enter one of three drainage ditches. The three ditches join Forked Gulch which then flows northward to eventually join the Arkansas

River. The three ditches near the site are intermittently dry and appear to contain flow only as a result of rainfall or melting snow. As alluded to when discussing the ground water pathway, water can be observed seeping into Forked Gulch. Even during dry periods, Forked Gulch contains water as it approaches the Arkansas River.

7.2 Targets

Although wetlands are not mapped along the drainage that leads to the Arkansas River, there are small areas that could be classified as wetlands in accordance with federal guidelines (as discussed previously in section 4.1.7). The Arkansas River below the 1st Street Bridge to Pueblo Reservoir is designated by the Colorado Department of Health and Environment, Water Quality Control Section as Class I Primary Contact Recreation, Class I Cold Water Aquatic Life, suitable for agricultural use, and as a domestic water supply. The City of Florence, located approximately 11 miles downstream from the site, receives 50% of its 2 million gallon-per-day water supply from the Arkansas River. Between Canon City and Florence, the Arkansas River has a relatively confined channel with cobble substrate that is recognized as an excellent cold water fishery. Species of special concern to the Colorado Division of Wildlife (CDOW) that inhabit this portion of the river are the red-bellied dace and the brown trout. Below Florence, the Arkansas River channel broadens and is characterized by a "transition zone" fishery containing diverse species and large numbers of fish. Bald Eagles are common to the Arkansas River below Canon City primarily during the winter months when the birds gather in large numbers in the Swallows area above Pueblo Reservoir. These wintering eagles may feed upstream as far as Canon City. This may also be true of resident osprey and great blue herons, which inhabit the Swallows area. The Swallows area is on the Arkansas River approximately 30 miles downstream from the site.

7.3 Sample Locations

To determine whether a release from the waste source had occurred via the surface water pathway, two types of samples were collected. The first group of samples were surface water samples that were collected concurrently with rainfall; the second group of samples were sediment samples. Samples were collected primarily from Forked Gulch, but some

samples were also collected from the run-off ditches just north of the site and from the confluence of Forked Gulch and the Arkansas River.

7.4 Analytical Results

Nineteen surface water samples were gathered to determine whether a release to the surface water pathway had occurred. The results are provided in Table 2. The sample that serves as the background sample is CC-SW-02. Sample CC-SW-02 was taken in the Arkansas River, upstream from where Forked Gulch joins the Arkansas River. Sample CC-SW-02 is the blank for all the surface water samples because flowing water was not available from any of the three ditches upstream from the site.

Sample CC-SW-01 was collected downstream from the confluence of Forked Gulch and the Arkansas River. Laboratory results indicate that a release into the Arkansas River is not occurring for any of the metals on the target analyte list, except for possibly lead. The release of lead into the Arkansas can be neither confirmed nor denied. The uncertainty arises because lead analysis failed QA/QC criteria. Lead failed its spiked sample recovery at 62% (see the quality assurance reports, Appendix C). In the worst case scenario, the background sample CC-SW-02, which was determined to be 3.0 µg/L, could actually be closer to 5 µg/L if the low bias is corrected. If the analysis of the background sample experienced a low bias, but the analysis of the downstream sample was accurate, then the downstream sample would be less than three times the background sample; however, if the background sample analysis was accurate and if the downstream sample experienced a low bias, then by definition a release did occur. Due to the failure of the QA/QC criteria, however, a release of lead into the Arkansas from the site cannot be addressed with a fair degree of certainty. Sample CC-SW-03, which was collected from Forked Gulch just before the confluence of Forked Gulch and the Arkansas River, did indicate the release of lead.

Releases of lead from the site to the surface waters of Forked Gulch have occurred, although there is a large variability in lead concentrations from sample location to sample location. The lowest concentration of lead along Forked Gulch occurred from the ground water seeps and from the "sewer" water influent. Because none of these samples exceeded lead levels of 5µg/L, lead concentrations in these samples were less than three

times the background level of CC-SW-02. The results of the ground water seep samples indicate that the ground water is not contaminated or that metals are not efficiently transported by the groundwater. Sample concentrations of lead for the remaining samples were usually above 50 µg/L; three samples exceeded 3,000 µg/L.

The three other metals of toxicological concern identified at the site were cadmium, arsenic, and mercury. Mercury was not detected in any of the surface water samples. Cadmium and arsenic were identified at high concentrations in several of the samples, including samples CC-SW-16, CC-SW-17, CC-SW-18, and CC-SW-19. The concentrations in these samples ranged from 4,000 µg/L to 18,000 µg/L for cadmium, and from 3,000 µg/L to 40,000 µg/L for arsenic. The locations of the four samples are within a short distance of the site; for samples located farther from the site along Forked Gulch, the concentrations of arsenic and cadmium decrease substantially. All of the sample concentrations for cadmium and arsenic fell below 100 µg/L along Forked Gulch. Several cadmium concentrations were below the instrument detection limit of 5 µg/L.

The four samples referenced above, CC-SW-16 and CC-SW-19, also showed elevated concentrations of the following elements: antimony, chromium, cobalt, copper, manganese, nickel, vanadium, and zinc. Two of these elements, cobalt and vanadium, were not identified in the earlier description of the waste source. An explanation for the elevated concentrations of the metals in these surface water samples is that the pH of these water samples was extremely acidic (pH 2). Acidic water is capable of leaching metals from the soils, and because the flow of water is intermittent at the points where the samples were collected, the metals can be concentrated due to cycles of leaching and drying. At sampling points further down along Forked Gulch, the concentrations of most of the analytes are sufficiently high to indicate a release, although their concentrations have been greatly reduced.

The second method by which a release via the surface water pathway is possible was investigated by analysis of sediment samples. The results for the sediment samples are provided in Tables 4 and 6, and in Appendix E. Sample CC-SE-16 was collected upstream of the confluence of Forked Gulch and the Arkansas River, and serves as the background sample. Based upon the analysis of CC-SE-16, sample CC-SE-15, which was collected downstream from the junction, does not indicate a release from the site. Sample CC-SE-

14, which was collected in Forked Gulch near the confluence of Forked Gulch and the Arkansas River, did indicate the release of metals. Samples CC-SE-02 serves as the background sample for sample CC-SE-14. The elements that were higher than three times the background levels for sample CC-SE-14 were arsenic, chromium, copper, iron, lead, manganese, nickel, and zinc.

Of the remaining samples, samples CC-SE-03 through CC-SE-13 indicate a release of metals from the site (sample CC-SE-01 may be considered a "dirty" background sample). Based on background sample CC-SE-02, a release of lead and arsenic occurred for samples CC-SE-03 through CC-SE-13. The highest levels of lead and arsenic in CC-SE-05 were 11,400 ppm and 330 ppm, respectively. The release of cadmium was confirmed for all of the samples except CC-SE-10. Mercury was found at levels three times above the background in samples CC-SE-04, CC-SE-05, and CC-SE-09. Other metals of significance for which a release can be confirmed are antimony, cobalt, chromium, copper, iron, manganese, nickel, vanadium, and zinc. The release was relatively large for iron and zinc.

7.5 Conclusions

Two targets were identified for the surface water pathway: the Arkansas River and the wetlands along Forked Gulch. Releases were confirmed for Forked Gulch, but could not be substantiated for the Arkansas River, although metals from sediment and surface water are probably entering the river. Samples CC-SW-03 and CC-SE-14, located just before the confluence of Forked Gulch and the Arkansas River, indicate levels of metals that are three times above their respective background levels. Due to the large flow of the Arkansas River, however, metals released from Forked Gulch are substantially dispersed or diluted.

8.0 SOIL EXPOSURE AND AIR PATHWAYS

8.1 Physical Conditions

The 60 acres of waste rock, tailings, and contaminated soils are essentially barren, i.e., little or no vegetative cover exists at the site. In addition, the waste tailings and soil are fine-grained and would appear to be susceptible to air borne migration from the site. Dusty conditions, however, have not been noted on recent visits to the site. The lack of dust

may be attributed to the ability of the soil and tailings to form a hard crust that may prevent the formation of dust. On visits to the site in 1991, the TAT did observe dusty conditions; however, at that time a fertilizer company was actively conducting business, and the vehicle traffic and the business operation probably prevented the formation of hard crust and enhanced the formation of dust. Thus, although dusty conditions may not be a current concern, they could easily recur.

Drainage ditches collect runoff from the site, but usually remain dry due to a lack of moisture. The College of the Canyons Smelter site is located in a semiarid climate zone. The mean annual precipitation is approximately 19 inches. The calculated net annual precipitation (mean precipitation less evapotranspiration) is 5.5 inches (Delaware 1986). The 2-year, 24-hour rainfall event is 1.5 inches (Dunne and Leopold 1978).

8.2 Soil and Air Targets

The soil target would primarily consist of people who are trespassing. There are no fences or other barriers restricting access to the site. Although the site is less than 1 mile from the Prospect Heights residential area of Canon City, the area is somewhat isolated by steep and irregular topography. Evidence of some foot traffic through the area exists, but inhabitation of the site or use of the site as a food source by threatened or endangered species is unlikely. With no residences within 1/2 mile of the site, the greatest soil exposure concerns appear to be unrestricted access by children, pedestrians, and recreational vehicles.

The primary air targets are workers within a 1/2-mile radius and the town of Prospect Heights, which is located within the 1-mile radius. Canon City, Brookside, and Lincoln Park are within a 4-mile radius of the site. The air target populations are summarized as follows.

Radius	Population
On site	0
0 - 1/4 mile	55 (workers)
1/4 - 1/2 mile	220 (workers)
1/2 - 1 mile	1,000
1 - 2 miles	2,500
2 - 3 miles	5,500
3 - 4 miles	6,000

The above population numbers are from field observation or are estimated based on the following population densities:

Canon City: 1,606 people per square mile
Brookside: 458 people per square mile
Lincoln Park: 981 people per square mile

8.3 Soil and Sample Locations

No soil exposure pathway samples were collected except for the waste source characterization samples discussed in Section 5.0.

8.4 Air Monitoring

8.4.1 Methodology

All air sampling stations were set up to sample in the breathing zone and were located in accordance with the approved sampling plan. The meteorologic station was set up between hi-vol sampler location 1 (HV-1) and locations HV-4 and HV-5. The wind vane was calibrated to true north. The meteorologic station recorded air temperature, barometric pressure, relative humidity, wind speed, and wind direction. This information was used to correct sampler flow rates and air concentrations to standard temperature and pressure conditions (STP).

The samplers were calibrated in place using a General Metal Works variable orifice calibrator. Calibration records are included in Table 10. The samplers were set to run for 24 hours at approximately 50 cfm.

All samplers were equipped with elapsed timers to record the total sample time. Each hi-vol was also equipped with a flow recorder that measured the flow throughout the sample period. Any fluctuations in flow during the sample period would be noted on the recorder disk. The flow recorder also served as a check on the elapsed timers.

8.4.2 Quality Assurance

The air samples were analyzed for metals and total suspended particulates (TSP). The analytical data were found to be of good quality with two exceptions. The TSP results, as explained the quality assurance report (Appendix C), were rejected due to poor precision in the measurements of the filter paper. Before and after the collection of the TSP on the filter paper, each filter paper was weighed a minimum of three times. The standard deviation of the measurements was calculated and determined to be 0.01 g. The typical mass of the TSP collected during a 24-hour sampling period was on the order of 0.02 to 0.04 g. Given that the standard deviation was consistently 25% to 50% of the analytical result, the TSP results were rejected.

Because the TSP results failed QA/QC criteria, zinc levels were used to gauge the amount of particulates released from the site. Unfortunately, some of the analyses for zinc failed QA/QC criteria as well. Filter blanks were analyzed with each sample delivery group. In the second sample delivery group, the filter blank produced a zinc concentration that was above the Contract Required Detection Limit (CRDL). Ordinarily, the sample results that are five times below the blank result are reported as undetected. The purpose of the low level zinc samples, however, was not necessarily to prove that a release had occurred, but to serve as background levels when determining the magnitude of release from the site. The magnitude of release was calculated by dividing the associated zinc level of the largest lead level by the associated zinc level of the smallest lead (i.e., background) level. If contamination of zinc occurred in all the samples at the same magnitude, or if only the low level samples were contaminated, then the values reported for the magnitude of release

are underestimated. The days on which the samples may have been contaminated are days four and five.

8.4.3 Analytical Results

Hi-vol samplers were set up on August 15, 1994. Actual operation of the hi-vol samplers began on August 17, 1994, and continued for three days. At the end of the third sampling day, heavy rains began to fall. The remaining two days of sampling were completed on August 23 and 24 after the area had dried out. The results for laboratory analysis of the air filters are included in Table 9.

The formulas used for determining the airborne concentrations are presented in Table 10, which shows the calculations used to determine the total volume of air sampled corrected to standard conditions by each sampler on each sampling day. This information was used to determine the average concentration per cubic meter for each of the elements of concern. When combined with wind speed and direction information from Figure 8, off-site migration of the contaminants can be determined. Table 11 shows the field increases for each day's samples comparing upwind and downwind concentrations and downwind versus background.

Day 1

The sampling period began at 1720 hours on August 16, 1994 with the start up of the hi-vol sampler at location HV-1. The last sampler was shut off at approximately 1830 hours on August 17, 1994. The wind rose for this period is shown on Figure 8. The predominant wind flow for this period was from the west-southwest at an average speed of 10.3 mph for 17% of tne sample period; winds were from the southwest at an average speed of 8 mph for 26% of the sample period; and the wind was calm for 32% of the sampling period.

Samplers HV-1, HV-2 and HV-3 (CC-A-1, CC-A-6 and CC-A-11) were located at the College of the Canyons, the business development park, and at Mariposa Road, respectively, and were downgradient of dominant winds. These samplers were located on the edge of the tailings disposal area and had elevated lead levels for this sampling event.

Sampler HV-1 (CC-A-1), located at the College of the Canyons, had the highest lead level for this sampling event. With the dominant wind from the west-southwest, the source of lead was probably from the smelter stack area. HV-4 and HV-5 (CC-A-16 and CC-A-21) were in the secondary wind direction and located near the red piles. HV-4 and HV-5 served as the duplicate samplers and were placed side-by-side. The wind from the southwest would load these samples. Sampler HV-6 (CC-A-26) was also in the secondary wind direction and located at the Colorado State Forest Service office. The distance from the source area probably accounts for the relatively low lead levels in the sample. Samples HV-7 and HV-8 (CC-A-31 and CC-A-36) were located at the municipal waste transfer facility and at the auto salvage yard, respectively. These samplers were in the background, or windward, for this sampling event. Relatively low zinc and lead levels below the detection limit characterized these samples.

Zinc was used as a background indicator metal, as zinc occurred in measurable levels in all the air samples and was present in the background soil sample. The background lead samples for this day were below the detection limit at HV-7 and HV-8 (CC-A-31 and CC-A-36). Elevated lead levels were noted in the dominant and secondary wind directions indicating a release had occurred. The highest lead level was 0.072 $\mu g/m^3$ at the College of the Canyons (CC-A-1). Using the zinc values, associated with the highest and lowest lead samples as an indicator of the magnitude, the release was approximately 17 times the background levels (0.204 $\mu g/m^3$ / 0.012 $\mu g/m^3$). Sampler HV-6, located approximately one-half mile from the perimeter of the site tailings in the secondary direction, had a lead level of 0.006 $\mu g/m^3$, slightly above the laboratory detection limit (CC-A-26).

Day 2

The sampling period began at 1730 hours on August 17, 1994 with the start up of the hi-vol sampler at location HV-1. The last sampler was shut off at approximately 1840 hours on August 18, 1994. The wind rose for this period is shown on Figure 8. The predominant wind flow for this period was from the west-southwest at an average speed of 8.5 mph for 39% of the sample period; winds were from the southwest at an average speed of 8.8 mph for 34% of the sample period; and the wind was calm for 36% of the sampling period.

Samplers HV-1, HV-2 and HV-3 (CC-A-2, CC-A-7 and CC-A-12) were located at the College of the Canyons, the business development park, and at Mariposa Road, respectively, and were downgradient of dominant winds. These samplers were located on the edge of the tailings area and had elevated lead levels. Sampler HV-3 (CC-A-12), located at Mariposa Road, had the highest lead level for this sampling event. HV-4 and HV-5 (CC-A-17 and CC-A-22) were in the secondary wind direction and located near the red piles (HV-4 and HV-5 are collocated). The wind from the southwest would affect these samples. Sampler HV-6 (CC-A-27) was also in the secondary direction and was located at the Colorado State Forest Service office. The distance from the source area probably accounts for the relatively low lead levels for the sample. Samplers HV-7 and HV-8 (CC-A-32 and CC-A-37) were located at the municipal waste transfer facility and at the auto salvage yard, respectively. These samplers were in the background wind direction for this sampling event. These samples exhibited relatively low zinc and lead levels that were below the detection limit.

Zinc was used as a background indicator metal because it occurred in measurable levels in all the air samples and was present in the background soil sample. The background lead samples for this day were below the detection limit at HV-8 (CC-A-37) and HV-7 (CC-A-32). Elevated lead levels were noted in the dominant and secondary wind directions, indicating an off-site release. The highest lead level was 0.062 $\mu g/m^3$ at the Mariposa Road sampler HV-3 (CC-A-12). Using the zinc values, associated with the highest and lowest lead samples, as an indicator of the magnitude, the release was approximately 3.5 times the background levels (0.046 $\mu g/m^3$ / 0.013 $\mu g/m^3$). Sampler HV-6, located approximately one-half mile from the perimeter of the site tailings in the secondary direction, had a lead level of 0.005 $\mu g/m^3$, slightly above the laboratory detection limit (CC-A-27).

Day 3

The sampling period began at 1745 hours on August 18, 1994 with the start up of the hi-vol sampler at location HV-1. The last sampler was shut off at approximately 1900 hours on August 19, 1994. The wind rose for this period is shown on Figure 8. Erratic and gusty winds characterized the weather pattern for this day's sampling event. Sustained (15 minute average) winds of 12.5 mph were noted. The predominant wind flow for this

period was from the southwest at an average speed of 8.6 mph for 24% of the sample period; wind was from the west-southwest at an average speed of 6.7 mph for 28% of the sampling period; and the wind was calm for 26% of the sampling period.

Samplers HV-2 and HV-3 (CC-A-8 and CC-A-13) were located at the business development park and at Mariposa Road, respectively, and were downgradient of dominant winds. These samplers were located on the edge of the tailings area and had elevated lead levels. Also in the dominant wind direction were HV-4 and HV-5 (CC-A-18 and CC-A-23) which were located near the red piles (HV-4 and HV-5 are collocated). Sampler HV-6 (CC-A-28) was also in the dominant direction and was located at the Colorado State Forest Service office. The distance from the source area probably accounts for the relatively low lead levels noted in the sample. Sampler HV-3 (CC-A-13) was located at the Mariposa Road and had the highest lead level for this sampling event. Sampler HV-8 (CC-A-38), located at the auto salvage yard, was in the background wind direction for this sampling event. Relatively low zinc and lead levels below the detection limit characterize this sample. The sampler at the municipal waste transfer facility, HV-7, had slightly elevated lead and zinc values near the values found for sampler HV-4 and HV-5 (CC-A-18 and CC-A-23). The erratic and gusty winds may account for the loading of this sampler.

Zinc was used as a background indicator metal because it occurred in measurable levels in all the air samples and was present in the background soil sample. The background lead sample for this day was below the detection limit at HV-8 (CC-A-38). Elevated lead levels were noted in the dominant and secondary wind directions indicating an off-site release did occur. The highest lead level was 0.044 $\mu g/m^3$ at the Mariposa Road sampler HV-3 (CC-A-13). Using the zinc values, associated with the highest and lowest lead samples, as an indicator of the magnitude, the release was approximately 2.3 times the background levels (0.040 $\mu g/m^3$ / 0.017 $\mu g/m^3$). Sampler HV-6, located approximately one-half mile from the perimeter of the site tailings in the dominant direction, had a lead level below laboratory detection limit (CC-A-27).

Day 4

The sampling period began at 1115 hours on August 23, 1994 with the start up of the hi-vol sampler at location HV-1. The last sampler was shut off at approximately 1215 hours

on August 24, 1994. The wind rose for this period is shown on Figure 8. Winds from the northeast and southwest characterized the weather pattern for this day's sampling event. The predominant wind flow for this period was from the northeast at an average speed of 8 mph for 14% of the sample period; winds were from the west-southwest at an average speed of 7 mph for 14% of this sample period; and the wind was calm for 34% of the sampling period.

No hi-vol samplers were downgradient of dominant winds for this day's sampling. Samplers HV-1, HV-2 and HV-3 (CC-A-4, CC-A-9 and CC-A-14) were located at the College of the Canyons, the business development park, and at Mariposa Road, respectively, and were in the secondary wind direction. These samplers were located on the edge of the tailings area and had elevated lead levels. Sampler HV-3 (CC-A-14) had the highest lead level for this sampling event at 0.065 $\mu g/m^3$. In a peripheral wind direction were HV-4 and HV-5 (CC-A-19 and CC-A-24) which were located near the red piles (4 and 5 are collocated). Sample HV-6 (CC-A-29) was also in the peripheral direction and was located at the Colorado State Forest Service office. The distance from the source area probably accounts for the relatively low lead levels noted in the sample. Samples HV-7 and HV-8 (CC-A-34 and CC-A-39) were located at the municipal waste transfer facility and at the auto salvage yard, respectively. These samplers were in the background wind direction for this sampling event. These samples exhibited relatively low zinc and lead levels that were below the detection limit.

Zinc was used as a background indicator metal because it occurred in measurable levels in all the air samples and was present in the background soil sample. The background lead samples for this day were below the detection limit at HV-8 (CC-A-39) and HV-7 (CC-A-34). Elevated lead levels were noted in the secondary and peripheral wind directions, indicating that a release off site occurred. The highest lead level was at the Mariposa Road sampler HV-3 (CC-A-14) at 0.065 $\mu g/m^3$. Using the zinc values, associated with the highest and lowest lead samples as an indicator of the magnitude, the release was approximately 3.3 times the background level (0.079 $\mu g/m^3$ / 0.024 $\mu g/m^3$). Sampler HV-6, located approximately one-half mile from the perimeter of the site tailings in the peripheral direction, had a lead level of 0.007 $\mu g/m^3$, slightly above the laboratory detection limit (CC-A-29).

Day 5

The sampling period began at 1120 hours on August 24, 1994 with the start up of the hi-vol sampler at location HV-1. The last sampler was shut off at approximately 1220 hours on August 25, 1994. The wind rose for this period is shown on Figure 8. Strong winds from the east-northeast and southwest characterized the weather pattern for this day's sampling event. The predominant wind flow for this period was from the southwest at an average speed of 12 mph for 28% of the sample period; winds were from the east at an average speed of 14.5 mph for 9% of the sampling period; and the wind was calm for 21% of the sampling period.

Samplers HV-2, HV-3, HV-4, HV-5, and HV-6 (CC-A-10, CC-A-15, CC-A-20, CC-A-25, and CC-A-30) were located at the business development park, at Mariposa Road, at the red piles (HV-4 and HV-5 were placed side by side) and at the Forest Service office, respectively, and were downgradient of dominant winds. Samplers HV-2, HV-3, HV-4, and HV-5 were located on the edge of the tailings area and had elevated lead levels. Sampler HV-6 (CC-A-30) was located at the Colorado State Forest Service office. The distance from the source area probably accounts for the relatively low lead level noted in this sample. Sampler HV-3 (CC-A-15) was located at Mariposa Road and had the highest lead level for this sampling event at 0.099 $\mu g/m^3$. Sampler HV-7 (CC-A-35), located at the Municipal waste transfer facility, was in the peripheral direction and had a slightly elevated lead level (0.011 $\mu g/m^3$). Sampler HV-8 (CC-A-40) was located at the auto salvage yard and was in the secondary wind direction for this sampling event. Because this sample exhibited relatively low zinc and lead levels that were below the detection limit, it was used as a background sample.

Zinc was used as a background indicator metal because it occurred in measurable levels in all the air samples and was present in the background soil sample. The background lead sample for this day was below the detection limit at HV-8 (CC-A-40). Elevated lead levels were noted in the dominant and secondary wind directions indicating an off-site release did occur. The highest lead level was at the Mariposa Road sampler HV-3 (CC-A-15) at 0.099 $\mu g/m^3$. Using the zinc values, associated with the highest and lowest lead samples, as an indicator of the magnitude, the release was approximately 4.3 times the background levels (0.073 $\mu g/m^3$ / 0.017 $\mu g/m^3$). Sampler HV-6, located approximately one-half mile

from the perimeter of the site tailings in the dominant direction, had a lead level below laboratory detection limit (CC-A-30).

8.5 Conclusions

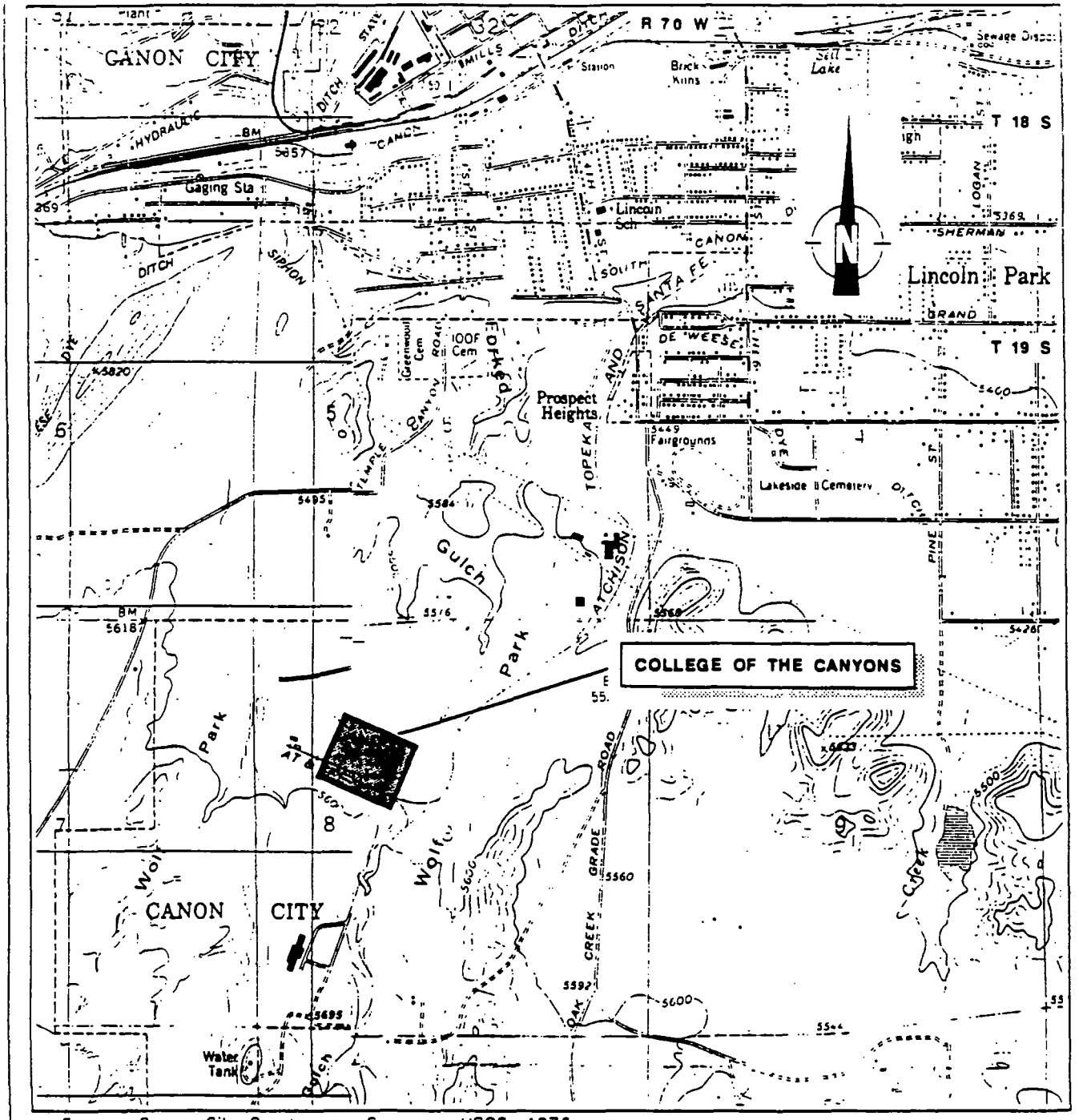
The analytical data suggest that a release of contaminants occurs via the air migration pathway. The lead released off-site exceeded the minimum values detected in the background samples for each day. The highest recorded level was 0.099 $\mu g/m^3$ lead on the fifth day of sampling. Of the eight hi-vol stations, five recorded detectable levels of lead for all five sampling days. The five stations were located at the College of the Canyons, the Fremont County Business Development Park, near Mariposa Road, and near the red tailing piles just north of the site. Two of the hi-vol samples, located at the Colorado State Forest Service Shops and at the BFH Transfer Station, recorded detectable levels of lead on some days, but not on others. The hi-vol station located at the Fremont Auto Salvage yard failed to detect lead on any of the sampling days.

9.0 SUMMARY AND CONCLUSIONS

Off-site releases were observed for the surface water pathway. Releases to the surface water pathway, however, were confirmed only for Forked Gulch, while releases to the Arkansas River could not be substantiated. Lead, arsenic, and cadmium were all detected in the surface water samples along Forked Gulch at levels three times above their respective background levels. Lead, arsenic, cadmium, and mercury were detected in sediment samples along Forked Gulch at levels confirming an off-site release. Other metals released but which are not as large a toxicological concern or were not present at relatively high concentrations, are antimony, cobalt, chromium, copper, iron, manganese, nickel, vanadium, and zinc. Technically, a release into the Arkansas could not be substantiated, but based upon samples collected from near the confluence of the Arkansas River and Forked Gulch, it is probable that metals are entering the Arkansas River. Due to the flow of the Arkansas River, metal-laden sediments are dispersed and contaminated water is diluted.

The hi-vol sampling indicated that a release is occurring to the air pathway. Targets that are consistently located in the pathway are workers at the Fremont County Business

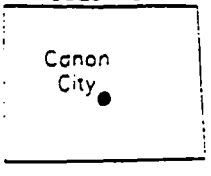
Development Park and at the College of the Canyons. Based on the results of the BFH Transfer Station and the Colorado State Forest Service the extent to which the release travels is limited. The hi-vol sampler located at the Fremont Auto Salvage yard, which did not detect the presence of lead, further indicates that lead migrating through the air is limited and also dependent upon the direction of the prevailing winds.



Source: Canon City Quadrangle, Colorado. USGS, 1976

0 1/2 1 MILE

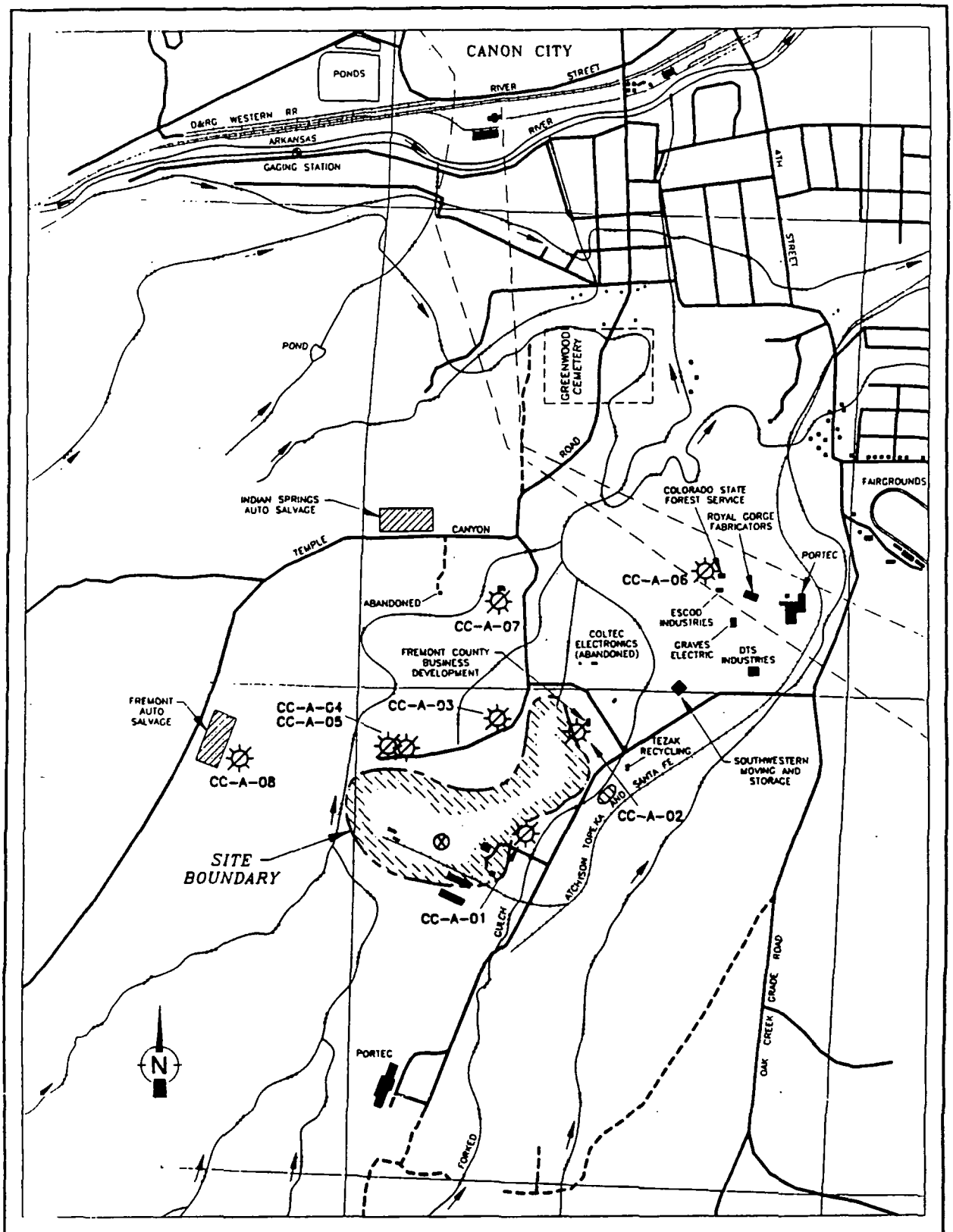
LOCATION MAP
COLORADO



LEGEND

Site location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-W0-0037
TITLE: COLLEGE OF THE CANYONS Canon City, Colorado SITE LOCATION MAP T.D.D. T08-9406-0501 ZTCOLCAN
ecology & environment, inc. DENVER, COLORADO — FIG. 1
Date: 07/06/94 Drawn by: RSM Scale:



TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

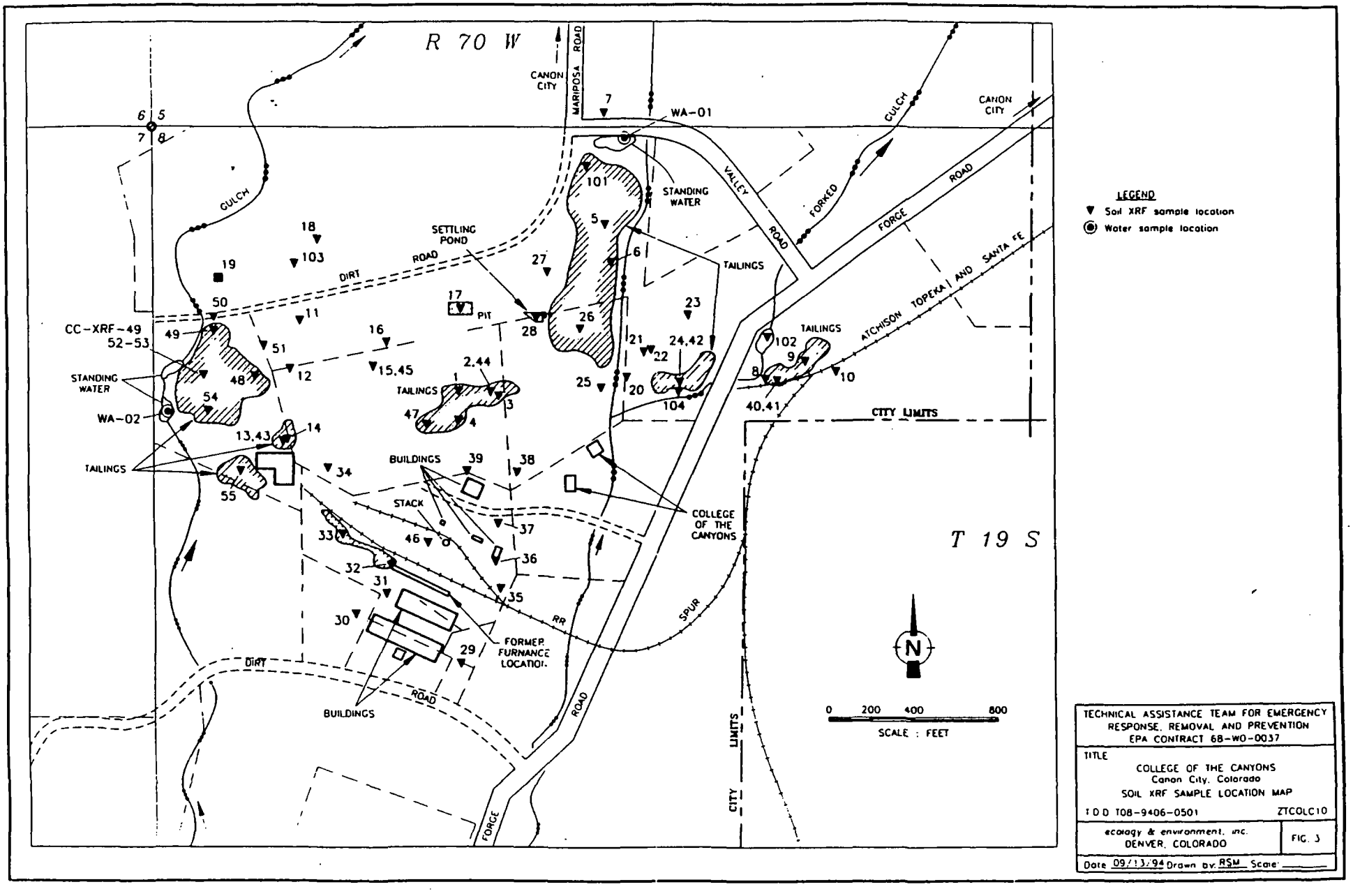
TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
HIVOL SAMPLE LOCATION MAP

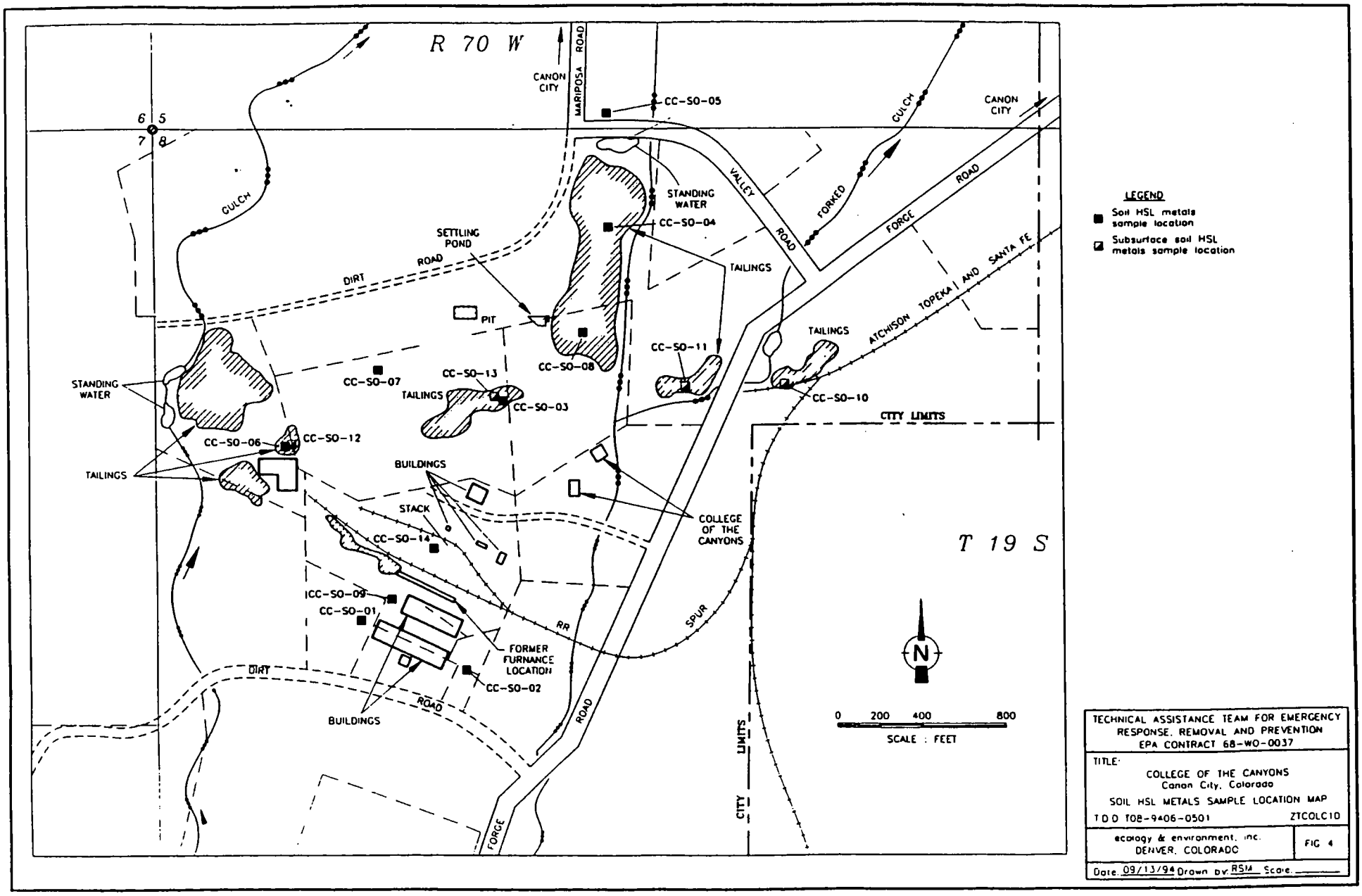
T.O.D. T08-9406-0501 ZTCOLCAS

ecology & environment, inc.
DENVER, COLORADO

FIG. 2

Date 09/22/94 Drawn By: RSM Scale


R 70 W
T 19 S
CANON CITY
MARIPOSA ROAD
WA-01
STANDING WATER
VALLEY ROAD
FORKED GULCH
FORCE ROAD
ATCHISON TOPEKA AND SANTA FE
GULCH
DIRT ROAD
SETTLING POND
PIT
TAILINGS
CC-XRF-49
52-53
STANDING WATER
WA-02
BUILDINGS
STACK
COLLEGE OF THE CANYONS
CITY LIMITS
FORMER FURNANCE LOCATION
RR SPUR
CITY LIMITS
0 200 400 800
SCALE : FEET
LEGEND
Soil XRF sample location
Water sample location
TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037
TITLE
COLLEGE OF THE CANYONS
Canon City, Colorado
SOIL XRF SAMPLE LOCATION MAP
T D D T08-9406-0501
ZTCOLC10
ecology & environment, inc.
DENVER, COLORADO
FIG. 3
Date 09/13/94 Drawn by RSM Scale



TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

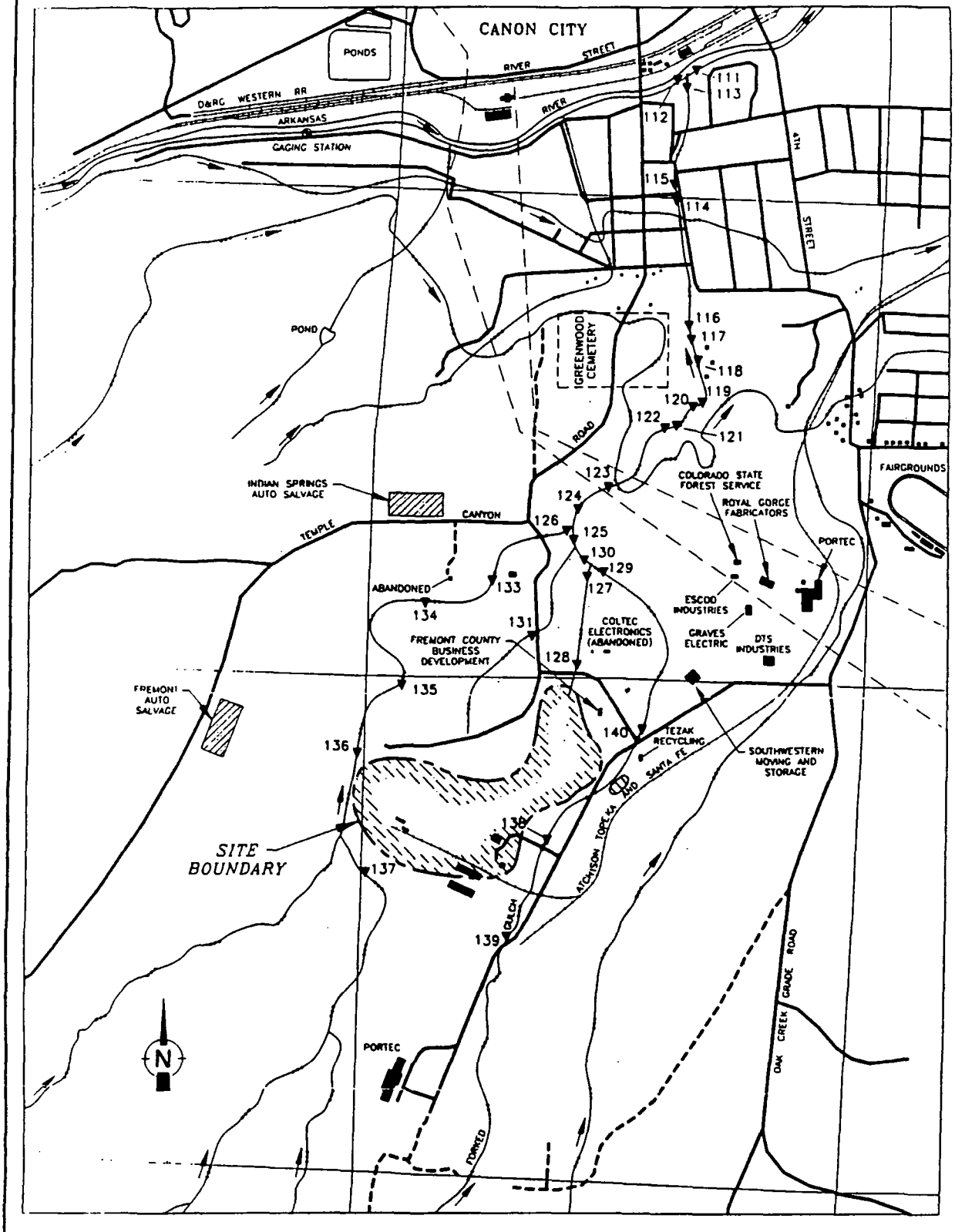
TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
SOIL HSL METALS SAMPLE LOCATION MAP

TDD T08-9406-0501 ZTCOLC10

ecology & environment, inc.
DENVER, COLORADO

FIG 4

Date 09/13/94 Drawn by RSM Scale



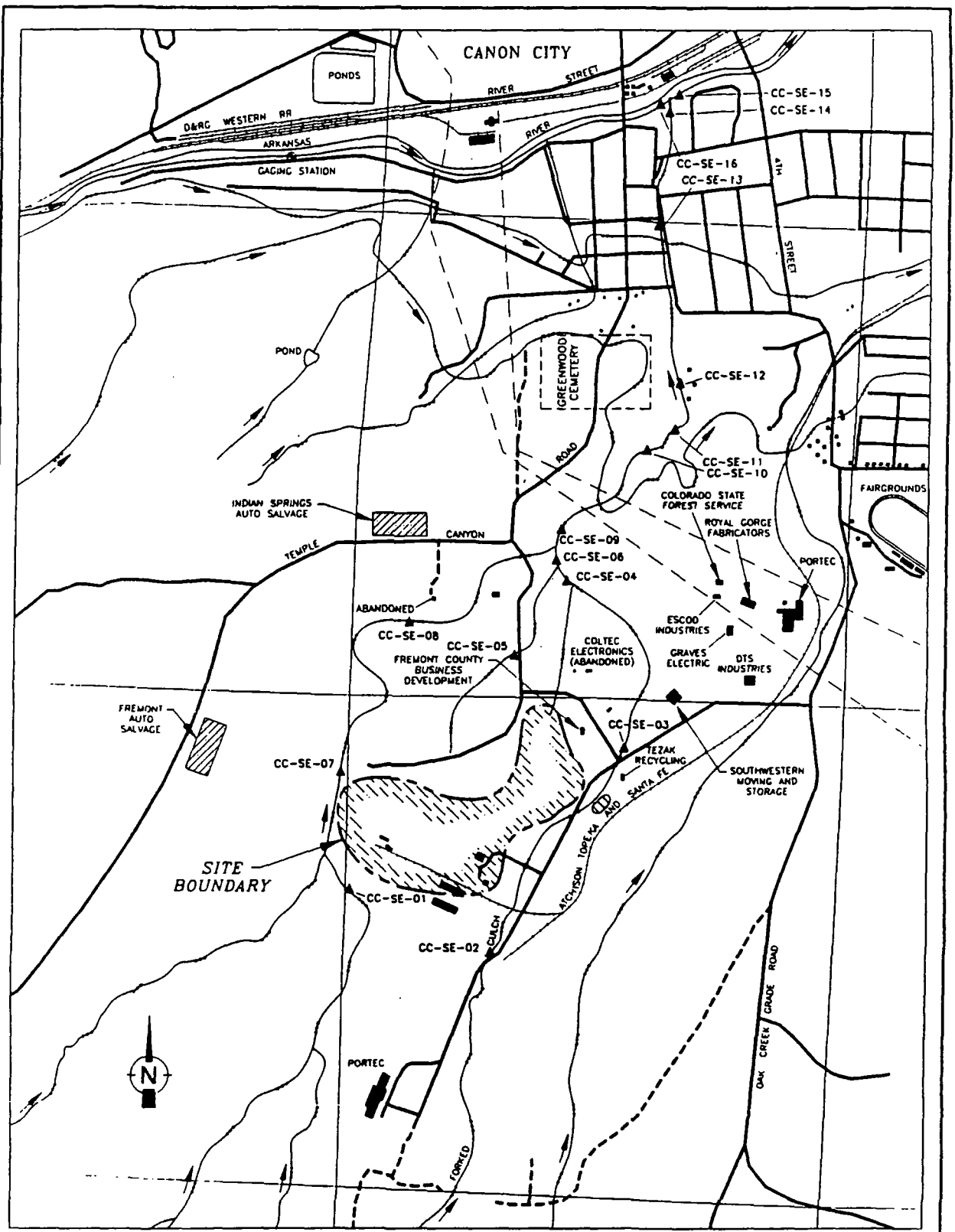
TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
SEDIMENT XRF SAMPLE LOCATION MAP

T.D.D. T08-9406-0501 ZTCOLCA5

ecology & environment, inc.
DENVER, COLORADO
FIG 5

Date: _____ Drawn by: RSW Scale _____



0 1000 2000 3000

SCALE : FEET

▲ Sediment HSL metals sample location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
SEDIMENT HSL METALS
SAMPLE LOCATION MAP

T.D.D T08-9406-0501 ZTCOLCA5

ecology & environment, inc
DENVER, COLORADO

FIG 6

Date: _____ Drawn by: RSM Scale _____

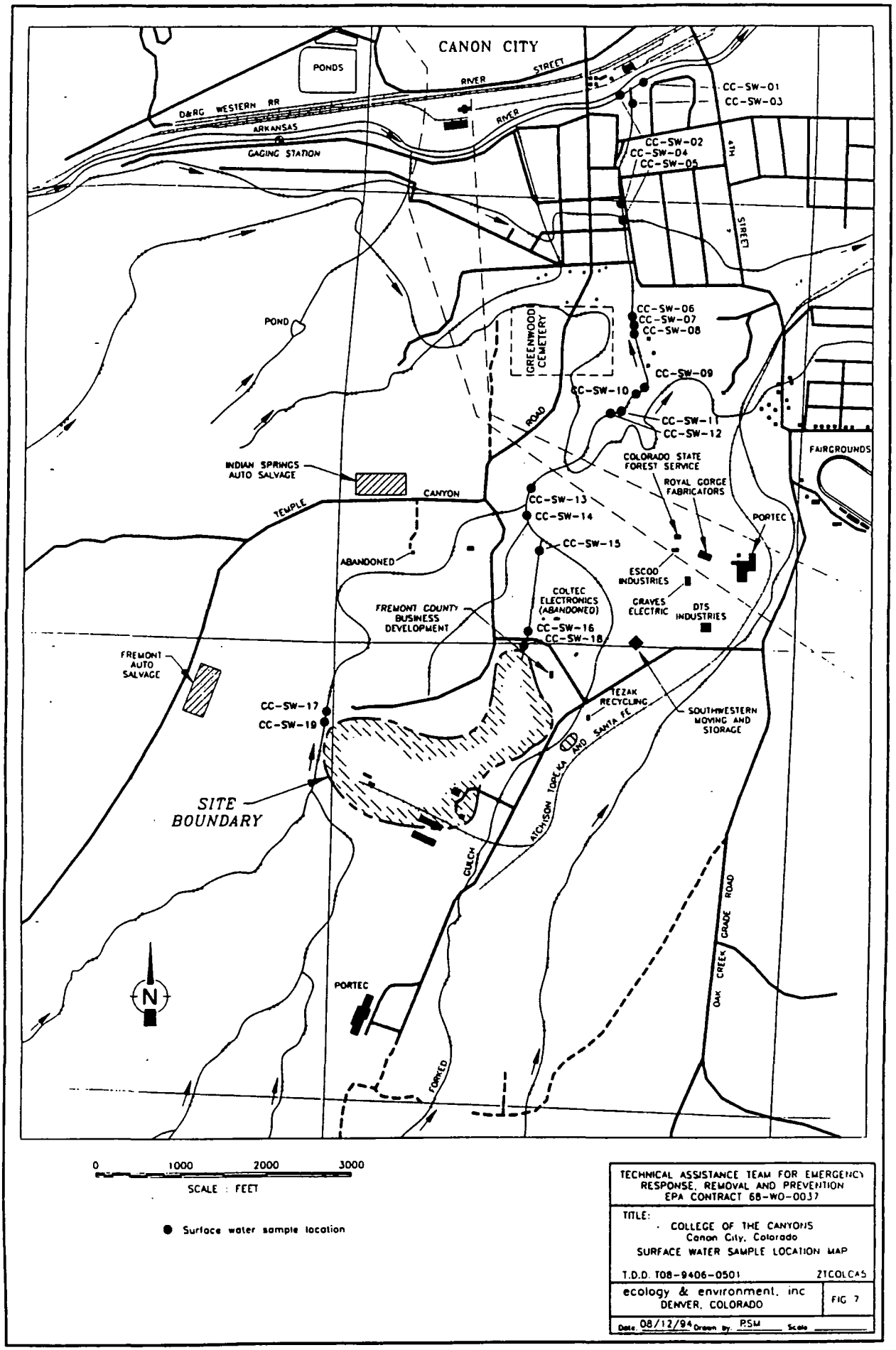

CANON CITY
PONDS
RIVER
STREET
D&RG WESTERN RR
ARKANSAS
RIVER
GAGING STATION
CC-SW-01
CC-SW-03
CC-SW-02
CC-SW-04
CC-SW-05
9TH
STREET
POND
GREENWOOD CEMETERY
CC-SW-06
CC-SW-07
CC-SW-08
CC-SW-09
CC-SW-10
CC-SW-11
CC-SW-12
ROAD
FAIRGROUNDS
INDIAN SPRINGS AUTO SALVAGE
CANYON
TEMPLE
COLORADO STATE FOREST SERVICE
ROYAL GORGE FABRICATORS
CC-SW-13
CC-SW-14
PORTEC
CC-SW-15
ABANDONED
ESCOO INDUSTRIES
COLTEC ELECTRONICS (ABANDONED)
GRAVES ELECTRIC
DTS INDUSTRIES
FREMONT COUNTY BUSINESS DEVELOPMENT
CC-SW-16
CC-SW-18
FREMONT AUTO SALVAGE
TEZAK RECYCLING
SOUTHWESTERN MOVING AND STORAGE
CC-SW-17
CC-SW-19
AND SANTA FE
SITE BOUNDARY
ATCHISON TOPEKA
GULCH
OAK CREEK
GRADE ROAD
PORTEC
CORRED
N
0
1000
2000
3000
SCALE : FEET
Surface water sample location
TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037
TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
SURFACE WATER SAMPLE LOCATION MAP
T.D.D. T08-9406-0501
21COLCAS
ecology & environment, inc
DENVER, COLORADO
FIG 7
Date 08/12/94 Drawn by PSM Scale

FIGURE 8

The wind roses will be submitted with the final draft copy.

TABLE 1 (page 1 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-A-1	Air	8-114401	8-16699	8/16/94	1750	ICP Metals
CC-A-2	Air	8-114402	8-16699	8/17/94	1800	ICP Metals
CC-A-3	Air	8-114403	8-16699	8/18/94	1735	ICP Metals
CC-A-4	Air	8-114425	8-19857	8/23/94	1115	ICP Metals
CC-A-5	Air	8-114426	8-19857	8/24/94	1125	ICP Metals
CC-A-6	Air	8-114404	8-16699	8/16/94	1840	ICP Metals
CC-A-7	Air	8-114405	8-16699	8/17/94	1840	ICP Metals
CC-A-8	Air	8-114406	8-16699	8/18/94	1810	ICP Metals
CC-A-9	Air	8-114427	8-19857	8/23/94	1150	ICP Metals
CC-A-10	Air	8-114428	8-19857	8/24/94	1200	ICP Metals
CC-A-11	Air	8-114407	8-16699	8/16/94	1830	ICP Metals
CC-A-12	Air	8-114408	8-16699	8/17/94	1827	ICP Metals
CC-A-13	Air	8-114409	8-16699	8/18/94	1800	ICP Metals
CC-A-14	Air	8-114429	8-19857	8/23/94	1135	ICP Metals
CC-A-15	Air	8-114450	8-19857	8/24/94	1145	ICP Metals
CC-A-16	Air	8-114410	8-16699	8/16/94	1810	ICP Metals
CC-A-17	Air	8-114411	8-16699	8/17/94	1810	ICP Metals
CC-A-18	Air	8-114412	8-16699	8/18/94	1745	ICP Metals
CC-A-19	Air	8-114431	8-19857	8/23/94	1128	ICP Metals
CC-A-20	Air	8-114432	8-19857	8/24/94	1130	ICP Metals
CC-A-21	Air	8-114413	8-16699	8/16/94	1820	ICP Metals

TABLE 1 (page 2 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-A-22	Air	8-114414	8-16699	8/17/94	1812	ICP Metals
CC-A-23	Air	8-114415	8-16699	8/18/94	1747	ICP Metals
CC-A-24	Air	8-114433	8-19856	8/23/94	1130	ICP Metals
CC-A-25	Air	8-114434	8-19856	8/24/94	1135	ICP Metals
CC-A-26	Air	8-114416	8-16698	8/16/94	1725	ICP Metals
CC-A-27	Air	8-114417	8-16698	8/17/94	1745	ICP Metals
CC-A-28	Air	8-114418	8-16698	8/18/94	1720	ICP Metals
CC-A-29	Air	8-114435	8-19856	8/23/94	1110	ICP Metals
CC-A-30	Air	8-114436	8-19856	8/24/94	1105	ICP Metals
CC-A-31	Air	8-114419	8-16698	8/16/94	1850	ICP Metals
CC-A-32	Air	8-114420	8-16698	8/17/94	1850	ICP Metals
CC-A-33	Air	8-114421	8-16698	8/18/94	1820	ICP Metals
CC-A-34	Air	8-114437	8-19856	8/23/94	1155	ICP Metals
CC-A-35	Air	8-114438	8-19856	8/24/94	1210	ICP Metals
CC-A-36	Air	8-114422	8-16698	8/16/94	1900	ICP Metals
CC-A-37	Air	8-114423	8-16698	8/17/94	1900	ICP Metals
CC-A-38	Air	8-114424	8-16698	8/18/94	1830	ICP Metals
CC-A-39	Air	8-114439	8-19856	8/23/94	1205	ICP Metals
CC-A-40	Air	8-114440	8-19856	8/24/94	1220	ICP Metals
CC-SW-01	Water	8-114328	8-16706	8/31/94	0953	IISL Metals

TABLE 1 (page 3 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-SW-02	Water	8-114329	8-16706	8/31/94	0956	HSL Metals
CC-SW-03	Water	8-114330	8-16706	8/31/94	0959	HSL Metals
CC-SW-04	Water	8-114331	8-16706	8/31/94	1011	HSL Metals
CC-SW-05	Water	8-114332	8-16706	8/31/94	1019	HSL Metals
CC-SW-06	Water	8-114333	8-16706	8/31/94	1027	HSL Metals
CC-SW-07	Water	8-114334	8-16706	8/31/94	1032	HSL Metals
CC-SW-08	Water	8-114335	8-16706	8/31/94	1034	HSL Metals
CC-SW-09	Water	8-114336	8-16706	8/31/94	1106	HSL Metals
CC-SW-10	Water	8-114337	8-16706	8/31/94	1108	HSL Metals
CC-SW-11	Water	8-114338	8-16706	8/31/94	1123	HSL Metals
CC-SW-12	Water	8-114339	8-16706	8/31/94	1132	HSL Metals
CC-SW-13	Water	8-114340	8-16706	8/31/94	1152	HSL Metals
CC-SW-14	Water	8-114341	8-16706	8/31/94	1155	HSL Metals
CC-SW-15	Water	8-114342	8-16706	8/31/94	1427	HSL Metals
CC-SW-16	Water	8-114343	8-16707	8/31/94	1335	HSL Metals
CC-SW-17	Water	8-114344	8-16707	8/31/94	1575	HSL Metals
CC-SW-18	Water	8-114345	8-16707	8/31/94	1435	HSL Metals
CC-SW-19	Water	8-114346	8-16707	8/31/94	1531	HSL Metals
CC-SE-01	Sediment	8-114361	8-16708	8/31/94	1530	HSL Metals/CN/XRF
CC-SE-02	Sediment	8-114362	8-16708	8/31/94	1553	HSL Metals/CN/XRF

TABLE 1 (page 4 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-SE-03	Sediment	8-114363	8-16708	8/31/94	1600	HSL Metals/CN/XRF
CC-SE-04	Sediment	8-114364	8-16708	8/31/94	1405	HSL Metals/CN/XRF
CC-SE-05	Sediment	8-114365	8-16708	8/31/94	1435	HSL Metals/CN/XRF
CC-SE-06	Sediment	8-114366	8-16708	8/31/94	1155	HSL Metals/CN/XRF
CC-SE-07	Sediment	8-114367	8-16708	8/31/94	1515	HSL Metals/CN/XRF
CC-SE-08	Sediment	8-114368	8-16708	8/31/94	1452	HSL Metals/CN/XRF
CC-SE-09	Sediment	8-114369	8-16708	8/31/94	1152	HSL Metals/CN/XRF
CC-SE-10	Sediment	8-114370	8-16708	8/31/94	1130	HSL Metals/CN/XRF
CC-SE-11	Sediment	8-114371	8-16708	8/31/94	1110	HSL Metals/CN/XRF
CC-SE-12	Sediment	8-114372	8-16708	8/31/94	1057	HSL Metals/CN/XRF
CC-SE-13	Sediment	8-114373	8-16709	8/31/94	1013	HSL Metals/CN/XRF
CC-SE-14	Sediment	8-114374	8-16709	8/31/94	0957	HSL Metals/CN/XRF
CC-SE-15	Sediment	8-114375	8-16709	8/31/94	0955	HSL Metals/CN/XRF
CC-SE-16	Sediment	8-114376	8-16709	8/31/94	1000	HSL Metals/CN/XRF
CC-SO-01	Soil	8-114347	8-16707	8/24/94	1001	HSL Metals/XRF
CC-SO-02	Soil	8-114348	8-16707	8/24/94	0952	HSL Metals/XRF
CC-SO-03	Soil	8-114349	8-16707	8/23/94	1223	HSL Metals/XRF
CC-SO-04	Soil	8-114350	8-16707	8/23/94	1454	HSL Metals/XRF
CC-SO-05	Soil	8-114351	8-16707	8/23/94	1512	HSL Metals/XRF
CC-SO-06	Soil	8-114352	8-16707	8/23/94	1655	HSL Metals/XRF

TABLE 1 (page 5 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-SO-07	Soil	8-114353	8-16707	8/23/94	1714	HSL Metals/XRF
CC-SO-08	Soil	8-114354	8-16707	8/24/94	0855	HSL Metals/XRF
CC-SO-09	Soil	8-114355	8-16707	8/24/94	1008	HSL Metals/XRF
CC-SO-10	Soil	8-114356	8-16707	8/24/94	1418	HSL Metals/CN/XRF
CC-SO-11	Soil	8-114357	8-16707	8/24/94	1434	HSL Metals/CN/XRF
CC-SO-12	Soil	8-114358	8-16708	8/24/94	1448	HSL Metals/CN/XRF
CC-SO-13	Soil	8-114359	8-16708	8/24/94	1530	HSL Metals/CN/XRF
CC-SO-14	Soil	8-114360	8-16708	8/24/94	1600	HSL Metals/XRF
CC-XRF-001	Soil	---	---	8/23/94	1205	XRF
CC-XRF-002	Soil	---	---	8/23/94	1212	XRF
CC-XRF-003	Soil	8-114349	8-16707	8/23/94	1223	HSL Metals/XRF
CC-XRF-004	Soil	---	---	8/23/94	1229	XRF
CC-XRF-005	Soil	8-114350	8-16707	8/23/94	1454	HSL Metals/XRF
CC-XRF-006	Soil	---	---	8/23/94	1503	XRF
CC-XRF-007	Soil	8-114351	8-26707	8/23/94	1512	HSL Metals/XRF
CC-XRF-008	Soil	---	---	8/23/94	1524	XRF
CC-XRF-009	Soil	---	---	8/23/94	1532	XRF
CC-XRF-010	Soil	---	---	8/23/94	1535	XRF
CC-XRF-011	Soil	---	---	8/23/94	1635	XRF
CC-XRF-012	Soil	---	---	8/23/94	1641	XRF

TABLE 1 (page 6 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-XRF-013	Soil	8-114352	8-16707	8/23/94	1655	HSL Metals/XRF
CC-XRF-014	Soil	---	---	8/23/94	1659	XRF
CC-XRF-015	Soil	8-114353	8-16707	8/23/94	1714	HSL Metals/XRF
CC-XRF-016	Soil	---	---	8/23/94	1719	XRF
CC-XRF-017	Soil	---	---	8/23/94	1730	XRF
CC-XRF-018	Soil	---	---	8/23/94	1750	XRF
CC-XRF-019	Soil	---	---	8/23/94	1801	XRF
CC-XRF-020	Soil	---	---	8/24/94	0751	XRF
CC-XRF-021	Soil	---	---	8/24/94	0757	XRF
CC-XRF-022	Soil	---	---	8/24/94	0800	XRF
CC-XRF-023	Soil	---	---	8/24/94	0809	XRF
CC-XRF-024	Soil	---	---	8/24/94	0822	XRF
CC-XRF-025	Soil	---	---	8/24/94	0850	XRF
CC-XRF-026	Soil	8-114354	8-16707	8/24/94	0855	HSL Metals/XRF
CC-XRF-027	Soil	---	---	8/24/94	0908	XRF
CC-XRF-028	Soil	---	---	8/24/94	0918	XRF
CC-XRF-029	Soil	8-114348	8-16707	8/24/94	0952	HSL Metals/XRF
CC-XRF-030	Soil	8-114347	8-16707	8/24/94	1001	HSL Metals/XRF
CC-XRF-031	Soil	8-114355	8-16707	8/24/94	1008	HSL Metals/XRF
CC-XRF-032	Soil	---	---	8/24/94	1016	XRF

TABLE 1 (page 7 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-XRF-033	Soil	---	---	8/24/94	1021	XRF
CC-XRF-034	Soil	---	---	8/24/94	1028	XRF
CC-XRF-035	Soil	---	---	8/24/94	1057	XRF
CC-XRF-036	Soil	---	---	8/24/94	1101	XRF
CC-XRF-037	Soil	---	---	8/24/94	1107	XRF
CC-XRF-038	Soil	---	---	8/24/94	1116	XRF
CC-XRF-039	Soil	---	---	8/24/94	1124	XRF
CC-XRF-040	Soil	---	---	8/24/94	1414	XRF
CC-XRF-041	Soil	8-114356	8-16707	8/24/94	1418	HSL Metals/CN/XRF
CC-XRF-042	Soil	8-114357	8-16707	8/24/94	1434	HSL Metals/CN/XRF
CC-XRF-043	Soil	8-114358	8-16708	8/24/94	1448	HSL Metals/CN/XRF
CC-XRF-044	Soil	8-114359	8-16708	8/24/94	1518	HSL Metals/CN/XRF
CC-XRF-045	Soil	8-114360	8-16708	8/24/94	1530	HSL Metals/CN/XRF
CC-XRF-046	Soil	---	---	8/24/94	1600	XRF
CC-XRF-047	Soil	---	---	8/24/94	1630	XRF
CC-XRF-048	Soil	---	---	8/25/94	1434	XRF
CC-XRF-049	Soil	---	---	8/25/94	1440	XRF
CC-XRF-050	Soil	---	---	8/25/94	1445	XRF
CC-XRF-051	Soil	---	---	8/25/94	1450	XRF
CC-XRF-052	Soil	---	---	8/25/94	1500	XRF

TABLE 1 (page 8 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-XRF-053	Soil	---	---	8/25/94	1505	XRF
CC-XRF-054	Soil	---	---	8/25/94	1509	XRF
CC-XRF-055	Soil	---	---	8/25/94	1515	XRF
CC-XRF-101	Sediment	---	---	8/23/94	1449	XRF
CC-XRF-102	Sediment	---	---	8/23/94	1547	XRF
CC-XRF-103	Sediment	---	---	8/23/94	1754	XRF
CC-XRF-104	Sediment	---	---	8/24/94	0827	XRF
CC-XRF-111	Sediment	8-114375	8-16709	8/31/94	0955	HSL Metals/CN/XRF
CC-XRF-112	Sediment	8-114376	8-16709	8/31/94	1000	HSL Metals/CN/XRF
CC-XRF-113	Sediment	8-114374	8-16709	8/31/94	0957	HSL Metals/CN/XRF
CC-XRF-114	Sediment	8-114373	8-16709	8/31/94	1013	HSL Metals/CN/XRF
CC-XRF-115	Sediment	---	---	8/31/94	1015	XRF
CC-XRF-116	Sediment	---	---	8/31/94	1027	XRF
CC-XRF-117	Sediment	---	---	8/31/94	1034	XRF
CC-XRF-118	Sediment	8-114372	8-16708	8/31/94	1057	HSL Metals/CN/XRF
CC-XRF-119	Sediment	---	---	8/31/94	1107	XRF
CC-XRF-120	Sediment	8-114371	8-16708	8/31/94	1110	HSL Metals/CN/XRF
CC-XRF-121	Sediment	---	---	8/31/94	1127	XRF
CC-XRF-122	Sediment	8-114370	8-16708	8/31/94	1130	HSL Metals/CN/XRF
CC-XRF-123	Sediment	---	---	8/31/94	1143	XRF

TABLE 1 (page 9 of 9)
SAMPLE SUMMARY
COLLEGE OF THE CANYONS SMELTER SITE
TDD # T08-9410-014

Sample ID	Sample Medium	EPA Tag Number	Chain-of-Custody	Sample Date	Sample Time	Analysis Requested
CC-XRF-124	Sediment	8-114369	8-16708	8/31/94	1152	HSL Metals/CN/XRF
CC-XRF-125	Sediment	8-114366	8-16708	8/31/94	1155	HSL Metals/CN/XRF
CC-XRF-126	Sediment	---	---	8/31/94	1153	XRF
CC-XRF-127	Sediment	---	---	8/31/94	1400	XRF
CC-XRF-128	Sediment	---	---	8/31/94	1337	XRF
CC-XRF-129	Sediment	---	---	8/31/94	1402	XRF
CC-XRF-130	Sediment	8-114364	8-16708	8/31/94	1405	HSL Metals/CN/XRF
CC-XRF-131	Sediment	8-114365	8-16708	8/31/94	1435	HSL Metals/CN/XRF
CC-XRF-132	Sediment	---	---	8/31/94	1430	XRF
CC-XRF-133	Sediment	---	---	8/31/94	1445	XRF
CC-XRF-134	Sediment	8-114368	8-16708	8/31/94	1452	HSL Metals/CN/XRF
CC-XRF-135	Sediment	---	---	8/31/94	1505	XRF
CC-XRF-136	Sediment	8-114367	8-16708	8/31/94	1515	HSL Metals/CN/XRF
CC-XRF-137	Sediment	8-114361	8-16708	8/31/94	1530	HSL Metals/CN/XRF
CC-XRF-138	Sediment	---	---	8/31/94	1550	XRF
CC-XRF-139	Sediment	8-114362	8-16708	8/31/94	1553	HSL Metals/CN/XRF
CC-XRF-140	Sediment	8-114363	8-16708	8/31/94	1600	HSL Metals/CN/XRF

TABLE 2 (page 1 of 3)
VALIDATED SURFACE WATER RESULTS (µg/L)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER:	CC-SW-01		CC-SW-02		CC-SW-03		CC-SW-04		CC-SW-05		CC-SW-06	
STATION LOCATION:	DOWNSTREAM IN AK		UPSTREAM IN AK		DRAINAGE BEFORE AK		UNDER STANLEY BRIDGE		IRRIGATION CANAL		CREEK BETWEEN HIGHLAND AND JUNKYARD	
DATE:	8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94	
TIME:	0953		0956		0959		1011		1019		1027	
Aluminum	1,910		1,550		1,340		6,910		2,170		30,900	
Antimony	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	52.0	J
Arsenic	2.0	U	2.0	U	2.6	J	16.9		2.0	U	74.6	
Barium	97.5	J	95.1	J	78.1	J	140	J	99.9	J	406	
Beryllium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Cadmium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	19.1	
Calcium	47,900		47,600		50,100		70,800		48,500		127,000	
Chromium	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	27.6	
Cobalt	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	11.6	J
Copper	10.0	U	10.0	U	10.0	U	46.2		10.0	U	211	
Iron	2,130		1,770		2,010		13,600		2,370		77,000	
Lead	12.1	J	3.0	J	62.0	J	758		7.3	J	4,300	
Magnesium	12,000		12,000		12,400		20,400		12,100		40,300	
Manganese	142		136		81.3		447		104		2,080	
Mercury	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	20.0	U	20.0	U	20.0	U	20.0	U	34.6	J	21.4	J
Potassium	2,510	J	4,300	J	4,200	J	9,440		4,210	J	24,200	
Selenium	5.0	R	5.0	R	10.0	R	10.0	R	10.0	R	10.0	R
Silver	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Sodium	15,500		15,100		15,500		23,000		16,000		44,500	
Thallium	2.0	UJ	2.0	UJ	2.0	UJ	2.0	UJ	2.0	UJ	2.0	UJ
Vanadium	10.0	U	10.0	U	10.0	U	13.1	J	10.0	U	78.1	
Zinc	80.3		38.5		151		629		119		2,980	

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
UJ = The material was analyzed for, but not detected. The reported detection limit is estimated because quality control criteria were not met.
R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

[illegible]

TABLE 2 (page 2 of 3)
VALIDATED SURFACE WATER RESULTS (µg/L)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER: / STATION LOCATION: / DATE: / TIME:	CC-SW-07 GW SEEP FROM HILLSIDE 8/31/94 1032		CC-SW-08 UPSTREAM OF SEEPS BEFORE KOCHS 8/31/94 1034		CC-SW-09 "SEWER" WATER INFLUENT 8/31/94 1106		CC-SW-10 UPSTREAM OF "SEWER" WATER INFLUENT 8/31/94 1108		CC-SW-11 GW @ TREE 8/31/94 1123		CC-SW-12 UPSTREAM OF GW @ TREE 8/31/94 1132	
Aluminum	103	U	16,400		50.0	U	20,000		254	U	6,760	
Antimony	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
Arsenic	2.2	J	51.2		2.0	U	95.7		2.0	U	33.4	
Barium	21.8	J	242		73.5	J	255		121	J	109	J
Beryllium	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Cadmium	5.0	U	7.5		5.0	U	13.6		5.0	U	5.0	U
Calcium	87,100		123,000		108,000		195,000		51,900		198,000	
Chromium	10.0	U	10.0	U	10.0	U	25.6		10.0	U	10.0	U
Cobalt	10.0	U	10.0	U	10.0	U	12.8	J	10.0	U	10.0	U
Copper	10.0	U	127		10.0	U	175		10.0	U	55.2	
Iron	1,250		42,400		87.6	J	54,400		347		16,400	
Lead	4.4	J	3,010		1.0	UJ	4,540		1.4	J	1,300	
Magnesium	29,600		37,300		35,400		62,200		13,300		62,300	
Manganese	136		1,070		84.2		1,290		14.6	J	693	
Mercury	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U
Nickel	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U
Potassium	5,320		20,100		5,570		20,100		10,700		16,400	
Selenium	10.0	R	10.0	R	10.0	R	10.0	R	10.0	R	10.0	R
Silver	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Sodium	49,200		46,600		28,200		114,000		11,600		123,000	
Thallium	2.0	UJ	2.0	UJ	2.0	U	2.0	UJ	2.0	U	2.0	UJ
Vanadium	10.0	U	38.8	J	10.0	U	50.4		10.0	U	17.8	J
Zinc	24.5		1,950		14.3	J	2,980		14.7	J	1,140	

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
UJ = The material was analyzed for, but not detected. The reported detection limit is estimated because quality control criteria were not met.
R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

[illegible]

TABLE 2 (page 3 of 3)
VALIDATED SURFACE WATER RESULTS (µg/L)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER:	CC-SW-13	CC-SW-14	CC-SW-15	CC-SW-16	CC-SW-17	CC-SW-18	CC-SW-19
STATION LOCATION:	DOWNSTREAM OF CONF. OF MAIN & WEST	UPSTREAM OF CONF. OF MAIN & WEST	W OF VALLEY RD AT MAIN & WEST	DRAINAGE N OF VALLEY RD & MAIN	WEST OF RED PILES	SE CORNER OF VALLEY RD & MARIPOSA	WESTERN DRAINAGE
DATE:	8/31/94	8/31/94	8/31/94	8/31/94	8/31/94	8/23/94	8/25/94
TIME:	1152	1155	1427	1335	1335	1435	1531
Aluminum	474 U	2,700	75.2 U	291,000	232,000	936,000	794,000
Antimony	50.0 U	50.0 U	50.0 U	2,120	2,240	5,620	8,580
Arsenic	3.0 J	15.2	2.1 J	20,600	2,780	40,100	6,700
Barium	33.3 J	54.1 J	35.8 J	59.5 J	7.4 J	5.9 J	25.0 U
Beryllium	5.0 U	5.0 U	5.0 U	13.8	15.7	40.5	54.6
Cadmium	5.8	5.0 U	5.0 U	7,270	4,070	18,200	14,600
Calcium	367,000	373,000	344,000	260,000	268,000	423,000	640,000
Chromium	10.0 U	10.0 U	10.0 U	194	179	467	676
Cobalt	10.0 U	10.0 U	10.0 U	92.4	311	286	1,260
Copper	15.0 J	16.3 J	10.0 U	21,100	34,700	48,700	111,000
Iron	1,310	4,730	301	2,930,000	5,690,000	6,120,000	13,900,000
Lead	82.5 J	224 J	7.0 J	130 J	20.0 UJ	20.0 UJ	20.0 UJ
Magnesium	122,000	121,000	99,700	91,900	304,000	237,000	892,000
Manganese	783	674	79.6	141,000	522,000	396,000	1,560,000
Mercury	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Nickel	20.0 U	20.0 U	20.0 U	275	2,140	832	7,510
Potassium	16,100	10,900	6,130	2,840 J	2,000 U	2,000 U	10,000 U
Selenium	10.0 R	1.7 R	10.0 R	10.0 R	20.0 R	20.0 R	20.0 R
Silver	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	50.0 U
Sodium	297,000	287,000	185,000	6,020	265 J	1,740 J	644 J
Thallium	2.0 UJ	2.0 UJ	2.0 UJ	20.0 UJ	40.0 U	40.0 U	41.2 J
Vanadium	10.0 U	10.0 U	10.0 U	208	10.0 U	686	50.0 U
Zinc	1,030	1,250	272	1,170,000	1,100,000	3,050,000	3,260,000

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
UJ = The material was analyzed for, but not detected. The reported detection limit is estimated because quality control criteria were not met.
R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

[illegible]

TABLE 3 (page 1 of 2)
VALIDATED SOIL RESULTS (mg/kg)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER:	CC-SO-01		CC-SO-02		CC-SO-03		CC-SO-04		CC-SO-05		CC-SO-06		CC-SO-07	
STATION LOCATION:	CC-XRF-030		CC-XRF-29		CC-XRF-003		CC-XRF-005		CC-XRF-007		CC-XRF-013		CC-XRF-015	
DATE:	8/24/94		8/24/94		8/23/94		8/23/94		8/23/94		8/23/94		8/23/94	
TIME:	1001		0952		1223		1454		1512		1655		1714	
Aluminum	9,950		12,300		1,270		1,060		14,700		22,000		1,180	
Antimony	10.3	U	15.2		13.7	U	21.1		10.5	U	389		70.6	
Arsenic	19.5	J	28.8	J	25.0	J	812	J	183	J	155	J	1,190	J
Barium	138		144		12.4	J	26.5	J	164		631		48.2	J
Beryllium	1.0	U	1.0	U	1.4	U	1.1	U	1.0	U	1.1	U	1.2	U
Cadmium	46.8		94.1		41.3		17.5		15.2		128		74.0	
Calcium	4,870		3,530		2,450		12,700		5,240		7,520		2,110	
Chromium	146	J	12.5	J	2.7	U	2.3	U	15.5	J	237	J	2.4	U
Cobalt	10.3		8.4	J	2.7	U	2.3	U	5.3	J	10.7	J	2.4	U
Copper	175		220		158		127		242		6,940		277	
Iron	25,400		22,800		286,000		250,000		67,600		37,600		405,000	
Lead	506		656		4,980		82,400		5,410		57,400		20,000	
Magnesium	2,730		3,900		822	J	273	J	3,920		2,220		3,350	
Manganese	972		624		919		11.4		498		790		9,560	
Mercury	0.04	U	0.08	J	0.06	U	3.4		0.17		4.8		0.16	
Nickel	10.7		11.8		5.5	U	8.2	J	12.3		2,860		4.8	U
Potassium	2,350		3,640		547	U	1,950		4,730		1,830		1,150	J
Selenium	1.0	R	1.0	R	1.4	R	1.1	R	1.0	R	1.1	R	1.2	R
Silver	2.9	J	4.7	J	3.0	J	122	J	11.2	J	24.8	J	27.9	J
Sodium	304	J	213	J	110	J	275	J	449	J	574	J	132	J
Thallium	0.41	U	0.42	J	0.59	J	7.9		0.95	J	3.3		3.8	
Vanadium	28.1		32.3		2.7	U	2.3	U	44.7		29.6		2.4	U
Zinc	8,960		10,700		9,070		878		2,750		170,000		12,600	
Cyanide	---		---		---		---		---		---		---	

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

TABLE 3 (page 2 of 2)
VALIDATED SOIL RESULTS (mg/kg)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER:	CC-SO-08		CC-SO-09		CC-SO-10		CC-SO-11		CC-SO-12		CC-SO-13		CC-SO-14	
STATION LOCATION:	CC-XRF-026		CC-XRF-031		CC-XRF-041		CC-XRF-042		CC-XRF-043		CC-XRF-045		CC-XRF-046	
DATE:	8/24/94		8/24/94		8/24/94		8/24/94		8/24/94		8/24/94		8/24/94	
TIME:	0855		1008		1418		1434		1448		1530		1600	
Aluminum	174		19,500		5,550		9,120		2,370		1,440		2,450	
Antimony	28.3		425		185	J	12.6	UJ	27.8	J	27.9	J	11.1	U
Arsenic	943	J	124	J	1,810		131		562		1,010		11.4	J
Barium	8.3	J	568		12.4	J	162		36.3	J	12.8	J	224	
Beryllium	1.1	U	1.1	U	1.2	U	1.3	U	1.2	U	1.3	U	1.1	U
Cadmium	25.4		1,070		632		14.8		43.8		153		13.8	
Calcium	1,100	J	10,600		20,600		42,400		1,940		1,450		17,700	
Chromium	2.2	U	198	J	9.9		3.8		5.5		2.6	U	2.4	J
Cobalt	2.2	U	15.6		2.3	U	27.2		2.5	J	2.6	U	2.2	U
Copper	94.2		7,710		1,430		1,030		466		212		18.8	
Iron	237,000		30,400		171,000		127,000		300,000		335,000		15,000	
Lead	146,000		53,600		18,700		4,460		19,800		19,600		517	
Magnesium	158	J	2,290		1,430		3,670		1,930		4,420		272	J
Manganese	12.6		828		2,190		1,850		3,090		15,900		37.6	
Mercury	0.86		2.6		0.47		0.19		0.36		0.14		0.67	
Nickel	7.1	J	2,590		4.7	U	5.4	J	189		5.1	U	4.4	U
Potassium	832	J	1,940		3,650		2,330		1,030	J	702	J	4,680	
Selenium	1.1	R	1.1	R	1.2	R	1.3	R	1.2	R	1.3	R	1.1	R
Silver	135	J	21.3	J	27.1		13.4		25.2		22.8		2.2	UJ
Sodium	89.0	J	587	J	243	J	500	J	254	J	137	J	619	J
Thallium	7.2		2.8		12.0		0.94	J	1.8	J	2.1	J	0.44	U
Vanadium	2.2	U	27.5		11.8		17.5		3.7	J	2.6	U	15.6	
Zinc	312		171,000		102,000	J	5,590	J	19,800	J	17,800	J	785	
Cyanide	---		---		0.59	U	0.63	U	0.59	U	0.64	U	---	

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
UJ = The material was analyzed for, but not detected. The reported detection limit is estimated because quality control criteria were not met.

TABLE 4 (page 1 of 2)
VALIDATED SEDIMENT RESULTS (mg/kg)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER:	CC-SE-01		CC-SE-02		CC-SE-03		CC-SE-04		CC-SE-05		CC-SE-06		CC-SE-07		CC-SE-08	
STATION LOCATION:	CC-XRF-137		CC-XRF-139		CC-XRF-140		CC-XRF-130		CC-XRF-131		CC-XRF-125		CC-XRF-136		CC-XRF-134	
DATE:	8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94	
TIME:	1530		1553		1600		1405		1435		1155		1515		1452	
Aluminum	5,320		3,300		14,100		31,800		16,000		18,800		6,690		11,100	
Antimony	10.7	UJ	10.6	UJ	14.3	J	15.6	UJ	27.0	J	14.1	UJ	13.8	J	35.0	J
Arsenic	1.6	J	0.89	J	6.1	J	201		330		47.0		99.0		61.3	
Barium	48.8		35.8	J	187		305		188		208		79.1		98.3	
Beryllium	1.1	U	1.1	U	1.1	U	1.6	U	1.4	U	1.4	U	1.2	U	1.2	U
Cadmium	2.1		1.1	U	37.3		42.1		17.1		10.1		8.2		7.2	
Calcium	6,060		4,090		20,900		26,200		2,850		11,500		3,220		3,460	
Chromium	6.6		3.5		13.0		27.5		16.0		17.1		6.4		14.6	
Cobalt	7.3	J	3.2	J	10.4	J	13.3	J	4.3	J	7.6	J	2.6	J	3.8	J
Copper	12.7		6.3		22.7		291		386		79.6		78.1		94.6	
Iron	18,700		7,630		22,300		66,400		108,000		36,000		115,000		68,600	
Lead	11.9		10.6		249		7,330		11,400		891		6,850		3,020	
Magnesium	3,390		1,830		6,630		11,800		4,160		7,280		2,610		3,470	
Manganese	247		143		1,910		1,420		558		545		421		629	
Mercury	0.04	U	0.04	U	0.05	U	0.30		0.49		0.05	J	0.05	U	0.05	U
Nickel	4.7	J	4.7	J	14.2		20.4		13.5		10.8	J	4.8	U	6.9	J
Potassium	1,360		780	J	4,500		9,440		5,410		4,510		2,410		3,060	
Selenium	1.1	R	0.21	R	1.1	R	1.6	R	1.4	R	1.4	R	1.2	R	1.2	R
Silver	2.1	U	2.1	U	2.2	U	13.3		22.5		2.8	U	13.3		3.8	
Sodium	195	J	145	J	248	J	4,230		654	J	588	J	343	J	366	J
Thallium	0.43	U	0.42	U	0.45	U	1.3	J	2.5	J	0.57	U	1.1	J	0.66	J
Vanadium	32.5		14.5		34.6		64.5		43.5		46.3		25.4		34.0	
Zinc	150	J	14	J	5,520	J	6,580	J	3,680	J	1,410	J	968	J	1,090	J
Cyanide	0.53	U	0.53	U	0.56	U	0.78	U	0.70	U	0.71	U	0.60	U	0.60	U

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
UJ = The material was analyzed for, but not detected. The reported detection limit is estimated because quality control criteria were not met.
R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

TABLE 4 (page 2 of 2)
VALIDATED SEDIMENT RESULTS (mg/kg)
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

STATION NUMBER:	CC-SE-09		CC-SE-10		CC-SE-11		CC-SE-12		CC-SE-13		CC-SE-14		CC-SE-15		CC-SE-16	
STATION LOCATION:	CC-XRF-124		CC-XRF-122		CC-XRF-120		CC-ZRF-118		CC-XRF-114		CC-XRF-113		CC-XRF-111		CC-XRF-112	
DATE:	8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94		8/31/94	
TIME:	1152		1130		1110		1057		1013		0957		0955		1000	
Aluminum	18,700		5,730		7,480		9,240		21,600		18,500		15,300		12,500	
Antimony	20.1	J	12.4	UJ	12.0	UJ	12.9	UJ	21.6	J	13.2	UJ	13.7	UJ	12.7	UJ
Arsenic	159		40.0		26.5		28.3		70.1		5.8	J	3.0	J	2.5	U
Barium	184		55.4		97.4		100		207		175		221		147	
Beryllium	1.5	U	1.2	U	1.2	U	1.3	U	1.5	U	1.3	U	1.4	U	1.3	U
Cadmium	16.1		2.7		5.7		6.1		13.5		2.7		2.3		1.8	
Calcium	13,700		3,570		3,660		6,120		9,700		29,700		20,000		18,000	
Chromium	19.3		5.4		8.1		9.6		21.9		19.1		21.9		17.7	
Cobalt	8.1	J	3.4	J	5.3	J	7.9	J	9.4	J	8.5	J	11.2	J	7.8	J
Copper	264		29.0		35.6		54.3		111		27.2		21.0		15.0	
Iron	78,600		23,200		25,400		32,100		46,400		25,900		29,700		21,700	
Lead	6,000		175		341		451		1,460		111		38.7	J	29.0	
Magnesium	6,950		2,970		3,210		4,010		8,090		14,900		9,870		8,570	
Manganese	800		376		447		594		1,060		560		575		376	
Mercury	0.19		0.05	U	0.05	U	0.05	U	0.10	J	0.05	U	0.05	U	0.05	U
Nickel	10.3	J	7.5	J	9.7		11.1		19.0		16.4		17.2		14.2	
Potassium	4,700		1,440		1,760		2,110		5,500		5,350		5,010		4,440	
Selenium	1.5	R	1.2	R	1.2	R	1.3	R	1.5	R	1.3	R	1.4	R	1.3	R
Silver	11.4		2.5	U	2.4	U	2.6	U	2.9	U	2.6	U	2.7	U	2.5	U
Sodium	936	J	287	J	212	J	273	J	359	J	284	J	322	J	280	J
Thallium	1.5	J	0.50	U	0.48	U	0.51	U	1.1	J	0.53	U	0.55	U	0.51	U
Vanadium	60.9		20.1		30.1		30.6		57.5		39.5		55.8		38.0	
Zinc	2,480	J	545	J	882	J	1,160	J	1,620	J	352	J	201	J	227	J
Cyanide	0.73	U	0.62	U	0.60	U	0.64	U	0.73	U	0.66	U	0.69	U	0.64	U

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.
J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.
UJ = The material was analyzed for, but not detected. The reported detection limit is estimated because quality control criteria were not met.
R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

Table 5 (Page 1 of 2): Canon City Soil XRF Qualified Results for Lead and Zinc

ID	Zn – Qual		Pb – Qual	
CCXRF001	4500		6100	
CCXRF002	2800		8700	
CCXRF003	6000		3300	
CCXRF004	2600		800	
CCXRF005	840		33000	
CCXRF006	2200		4000	
CCXRF007	2600		4700	
CCXRF008	34000		9300	
CCXRF009	2500		10000	
CCXRF010	7100		1900	
CCXRF011	2000		9700	
CCXRF012	9200		5600	
CCXRF013	125000		31000	
CCXRF014	38000		11000	
CCXRF015	7800		9000	
CCXRF016	1600		600	
CCXRF017	4600		11000	
CCXRF018	540		510	
CCXRF019	510		660	
CCXRF020	4200		11000	
CCXRF021	3000		8500	
CCXRF022	3200		2900	
CCXRF023	5200		4400	
CCXRF024	2900		9400	
CCXRF025	2300		12000	
CCXRF026	270	J	48000	
CCXRF027	670		470	
CCXRF028	12000		13000	
CCXRF029	14000		620	
CCXRF030	9400		430	
CCXRF031	137000		34000	
CCXRF032	2400		8500	
CCXRF033	8200		5200	
CCXRF034	116000		23000	
CCXRF035	113000		4700	
CCXRF036	2900		1400	
CCXRF037	20000		3600	
CCXRF038	9600		4900	
CCXRF039	16000		8200	
CCXRF040	47000		11000	
CCXRF041	39000		9600	
CCXRF042	4900		3700	
CCXRF043	43000		15000	
CCXRF044	3200		6700	
CCXRF045	7300		13000	
CCXRF046	840		300	
CCXRF047	14000		38000	

Table 5 (Page 2 of 2): Canon City Soil XRF Qualified Results for Lead and Zinc

ID	Zn – Qual		Pb – Qual	
CCXRF048	1900		6100	
CCXRF049	6800		5500	
CCXRF050	780		1400	
CCXRF051	32000		5500	
CCXRF052	8200		10000	
CCXRF053	13000		7400	
CCXRF054	3600		9900	
CCXRF055	2200		6700	

Table 6 (Page 1 of 1): Canon City Sediment XRF Qualified Results for Lead and Zinc

ID	Zn (ppm)		Pb (ppm)	
CCXRF101	1700		3900	
CCXRF102	13000		8200	
CCXRF103	3100		2200	
CCXRF104	3400		7300	
CCXRF111	300		59	U
CCXRF112	290		59	U
CCXRF113	430		77	J
CCXRF114	1300		640	
CCXRF115	890		360	
CCXRF116	780		320	
CCXRF117	660		150	J
CCXRF118	910		340	
CCXRF119	690		300	
CCXRF120	880		300	
CCXRF121	820		340	
CCXRF122	590		210	
CCXRF123	540		360	
CCXRF124	1800		3300	
CCXRF125	1400		710	
CCXRF126	390		400	
CCXRF127	510		260	
CCXRF128	560		120	J
CCXRF129	320		190	J
CCXRF130	5500		5400	
CCXRF131	2800		6400	
CCXRF132	4100		560	
CCXRF133	560		410	
CCXRF134	810		2600	
CCXRF135	1800		2100	
CCXRF136	750		3800	
CCXRF137	230	J	59	U
CCXRF138	1400		59	U
CCXRF139	86	J	78	J
CCXRF140	5300		140	J

TABLE 7 (page 1 of 2)
SCREENING AND CONFIRMATION SAMPLE ANALYSES
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

Sample No.	XRF	Lead/Lab	Lead/XRF	% Recovery	Zinc/Lab	Zinc/XRF	% Recovery
CC-SO-01	030	506	430	85	8,960	9,400	105
CC-SO-02	029	656	620	95	10,700	14,000	131
CC-SO-03	003	4,980	3,300	66	9,070	6,000	66
CC-SO-04	005	82,400	33,000	40	878	840	96
CC-SO-05	007	5,410	4,700	87	2,750	2,600	95
CC-SO-06	013	57,400	31,000	54	170,000	125,000	74
CC-SO-07	015	20,000	9,000	45	12,600	7,800	62
CC-SO-08	026	146,000	48,000	33	312	270 J	87
CC-SO-09	031	53,600	34,000	63	171,000	137,000	80
CC-SO-10	041	18,700	9,600	51	102,000	39,000	38
CC-SO-11	042	4,460	3,700	83	5,590	4,900	88
CC-SO-12	043	19,800	15,000	76	19,800	43,000	217
CC-SO-13	045	19,600	13,000	66	17,800	73,00	41
CC-SO-14	046	517	300	58	785	840	107
CC-SE-01	137	12	59 U	1,900	150	230 J	153
CC-SE-02	139	11	78 J	700	14	86 J	614
CC-SE-03	140	249	140 J	56	5,520	5,300	96

J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.

TABLE 7 (Page 2 of 2)
SCREENING AND CONFIRMATION SAMPLE ANALYSES
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

Sample No.	XRF	Lead/Lab	Lead/XRF	% Recovery	Zinc/Lab	Zinc/XRF	% Recovery
CC-SE-04	130	7,330	5,400	74	6,580	5,500	84
CC-SE-05	131	11,400	6,400	56	3,680	2,800	76
CC-SE-06	125	891	710	80	1,410	1,400	99
CC-SE-07	136	6,850	3,800	55	968	750	77
CC-SE-08	134	3,020	2,600	86	1,090	810	74
CC-SE-09	124	6,000	3,300	55	2,480	1,800	73
CC-SE-10	122	175	210	120	545	590	108
CC-SE-11	120	341	300	88	882	880	100
CC-SE-12	118	451	340	75	1,160	910	78
CC-SE-13	114	1,460	640	44	1,620	1,300	80
CC-SE-14	113	111	77 J	69	352	430	122
CC-SE-15	111	39	59 U	151	201	300	149
CC-SE-16	112	29	59 U	203	227	290	128

J = The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quality control criteria were not met.

U = The material was analyzed for, but not detected. The associated numerical value is the sample detection limit or adjusted sample detection limit.

TABLE 8 (page 1 of 1)
STATISTICAL ANALYSIS OF SCREENING AND CONFIRMATION SAMPLES
COLLEGE OF THE CANYONS SMELTER SITE
TDD #T08-9410-014

	No. of Samples	Average %	σ_{n-1}	Multiplier
Lead Samples				
All samples	26	68	20	1.47
100-1,000 ppm	9	81	20	1.23
1,000-10,000 ppm	8	69	17	1.45
>10,000 ppm	9	54	13	1.85
Zinc Samples				
All samples	28	94	35	1.06
100-1,000 ppm	9	108	22	0.93
1,000-10,000 ppm	12	84.5	12	1.18
>10,000 ppm	7	92	63	1.09

ppm = parts per million

TABLE 9 (1 of 4)

T08-9410-014
CANON CITY AIR DATA RAW ANALYTICAL RESULTS

		CC-A-1	CC-A-2	CC-A-3	CC-A-4	CC-A-5	CC-A-6	CC-A-7	CC-A-8	CC-A-9	CC-A-10
TSP	(g)	0.0332	0.0236	0.0255	0.0388	0.042	0.0014	0.0679	0.0376	0.0368	0.0731
Al	(ug)	631	442	350	671	521	418	597	461	758	543
Sb	(ug)	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U
As	(ug)	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
Ba	(ug)	10.4 B	8.4 B	5.8 B	10.4 B	8.4 B	6.7 B	8.6 B	7.8 B	11.7 B	8.1 B
Be	(ug)	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Cd	(ug)	3.1	1.6	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Ca	(ug)	944 B	814 B	626 B	1310	867 B	717 B	887 B	800 B	1440	827 B
Cr	(ug)	2.3 B	2.6	1.9 B	3.3	2.6	2.1 B	2 B	2.5	3	2.2 B
Co	(ug)	4.6 B	5.5 B	4 B	1.8	1.8 U	4 B	4 B	3.2 B	1.8 U	1.8 U
Cu	(ug)	41.7	23.8	21.1	21.9 U	16.3	90.1	71.4	57.9	98.8	49
Fe	(ug)	2290	930	848	833	799	1160	1180	1020	991	798
Pb	(ug)	147	40.2	61.6	16.3	23.3	94.5	72.9	54.4	16.7	27.4
Mg	(ug)	282 B	237 B	184 B	316 B	249 B	217 B	287 B	215 B	356 B	218 B
Mn	(ug)	45.4	25	20.5	26.9	26.2	25.8	21.4	21.2	27.5	17.3
Ni	(ug)	9.8 B	9.4 B	6.7 B	5.1 B	5 U	5 B	5.2 B	5.6 B	5 U	5 U
K	(ug)	262 B	176 B	151 B	389 B	279 B	163 B	204 B	229 B	504 B	386 B
Se	(ug)	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U
Ag	(ug)	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U
Na	(ug)	746 B	476 B	455 B	317 B	262 B	527 B	513 B	561 B	448 B	274 B
Th	(ug)	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U
V	(ug)	1.5 U	1.5 U	1.5 U	2.2 B	1.8 B	1.5 U	1.6 B	1.5 U	3 B	2.5 B
Zn	(ug)	413	289	191	97.5	188	145	92	86	65.5 J	57.6 J

TABLE 9 (2 of 4)

T08-9410-014
CANON CITY AIR DATA RAW ANALYTICAL RESULTS

		CC-A-11	CC-A-12	CC-A-13	CC-A-14	CC-A-15	CC-A-16	CC-A-17	CC-A-18	CC-A-19	CC-A-20
TSP	(g)	0.027	0.059	0.0335	0.0511	0.0455	0.0183	0.0331	0.0394	0.0208	0.0209
Al	(ug)	573	605	453	826	691	547	458	389	733	562
Sb	(ug)	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U
As	(ug)	10.7 U	10.7 U	10.7 U	10.7 U	10.7 B	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
Ba	(ug)	9 B	10.3 B	8.2 B	13.7 B	12.9 B	8.8 B	7.7 B	6.7 B	11.3 B	9 B
Be	(ug)	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Cd	(ug)	1.2 U	1.5	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Ca	(ug)	781 B	852 B	780 B	1410	929 B	1150 B	936 B	799 B	1400	960 B
Cr	(ug)	2.3 B	2.3 B	2.1 B	2.7	1.8 U	2.8	2.4 B	1.8 B	2.8	1.8 U
Co	(ug)	3.3 B	3.5 B	2.4 B	1.8 U	1.8 U	6.4 B	6.6 B	5.1 B	1.8 U	1.8 U
Cu	(ug)	53.5	66.3	63.2	71.9	52.9	100	110	69	99	105
Fe	(ug)	1830	2110	1500	2290	2930	1440	1040	1050	1020	974
Pb	(ug)	133	123	92.8	127	197	44.5	22.1	41.3	25.7	39.6
Mg	(ug)	227 B	278 B	214 B	358 B	304 B	262 B	249 B	217 B	340 B	251 B
Mn	(ug)	19	24.1	19.4	32.3	30.9	27.5	24.4	21.7	26.6	21
Ni	(ug)	5 B	6.1 B	5.9 B	5 U	5 U	5 U	5.1 B	5 U	5 U	5 U
K	(ug)	196 B	315 B	168 B	493 B	457 B	196 B	184 B	151 B	418 B	393 B
Se	(ug)	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U
Ag	(ug)	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U
Na	(ug)	520 B	588 B	392 B	408 B	306 B	651 B	595 B	666 B	325 B	281 B
Th	(ug)	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U
V	(ug)	1.5 U	1.5 U	1.5 U	2.7 B	2.7 B	1.5 U	1.5 U	1.5 U	3 B	2.2 B
Zn	(ug)	100	92.1	84.3	153	144	79.1	50.9	69.2	71.1 J	105

TABLE 9 (3 of 4)

T08-9410-014
CANON CITY AIR DATA RAW ANALYTICAL RESULTS

		CC-A-21	CC-A-22	CC-A-23	CC-A-24	CC-A-25	CC-A-26	CC-A-27	CC-A-28	CC-A-29	CC-A-30
TSP	(g)	0.0278	0.0411	0.0466	0.019	0.0164	0.0332	0.0448	0.0129	0.0196	0.0215
Al	(ug)	471	477	408	696	441	433	427	490	841	811
Sb	(ug)	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U
As	(ug)	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
Ba	(ug)	7.8 B	7.2 B	7 B	10.6 B	8.1 B	7.4 B	8 B	9.4 B	14.2 B	13.8 B
Be	(ug)	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Cd	(ug)	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Ca	(ug)	1130 B	819 B	716 B	1350	913 B	909 B	908 B	1050 B	1740	1510
Cr	(ug)	2.1 B	2.5 B	2.5 B	2.4 B	1.8 U	1.8 U	2 B	2.5	3	2 B
Co	(ug)	5.1 B	4.2 B	3.2 B	1.8 U	1.8 U	5.1 B	4.2 B	9.5 B	1.9 B	3.3 B
Cu	(ug)	69.9	60.6	51.1	97.7	58.5	40.2	38.9	39	35.4	43
Fe	(ug)	1270	971	1080	1030	924	548	570	703	1090	1080
Pb	(ug)	31.4	13.8	40.2	23.6	33.9	11.6 B	10.6 B	10 U	13.5	10 U
Mg	(ug)	228 B	218 B	204 B	323 B	219 B	209 B	240 B	238 B	403 B	375 B
Mn	(ug)	25.1	22.1	21.8	26.2	20	11.7	14.1	16.9	31.8	28.1
Ni	(ug)	5 U	6.2 B	5.1 B	5 U	5 U	5.2 B	6 U	5 U	5 U	5 U
K	(ug)	180 B	159 B	159 B	432 B	357 B	93 U	131 B	172 B	518 B	425 B
Se	(ug)	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U
Ag	(ug)	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U
Na	(ug)	724 B	423 B	523 B	303 B	289 B	467 B	471 B	445 B	379 B	282 B
Th	(ug)	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U
V	(ug)	1.5 U	1.5 U	1.9 B	2.4 B	2 B	1.5 U	1.5 U	1.5 U	2.8 B	3 B
Zn	(ug)	58.5	42.6	69.5	68.3 J	95.6	33.9	31.2	27.2	45.7 J	43.5 J

TABLE 9 (4 of 4)

T08-9410-014
CANON CITY AIR DATA RAW ANALYTICAL RESULTS

		CC-A-31	CC-A-32	CC-A-33	CC-A-34	CC-A-35	CC-A-36	CC-A-37	CC-A-38	CC-A-39	CC-A-40
TSP	(g)	0.0165	0.0027	0.0703	0.0386	0.0432	0.0115	0.0606	0.019	0.0137	0.0504
Al	(ug)	527	503	1590	1160	961	465	1260	521	1040	542
Sb	(ug)	9 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U	21.4 B	9 U
As	(ug)	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	21.3 U	10.7 U
Ba	(ug)	7.9 B	8 B	22.3 B	17.7 B	16 B	8.6 B	21 B	9.2 B	15.7 B	10 B
Be	(ug)	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.3 U	0.15 U
Cd	(ug)	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.4 U	1.2 U
Ca	(ug)	811 B	837 B	2550	2100	1690	1160 B	3930	1310	336000	1660
Cr	(ug)	1.8 U	1.8 U	3.2	2.9	2.9	2.2 B	3.5	2.5	3.6 U	3.6
Co	(ug)	4.6 B	4.1 B	8.2 B	1.8 U	1.8 U	3.3 B	4.5 B	4.4 B	3.6 U	1.8 U
Cu	(ug)	162	142	117	134	119	259	225	246	232	185
Fe	(ug)	786	696	2370	1540	1650	512	1450	657	1020	692
Pb	(ug)	10 U	10 U	18.3	10 U	21.3	10 U	10 U	10 U	20 U	10 U
Mg	(ug)	250 B	254 B	734 B	540 B	472 B	205 B	593 B	223 B	4760	274 B
Mn	(ug)	18.2	17.1	54.9	43.6	42.9	11.7	32.5	12.7	41.8	17.6
Ni	(ug)	5 U	5 U	5 U	5.2 B	5 U	5 U	5 U	5 U	10.1 U	5 U
K	(ug)	196 B	151 B	495 B	621 B	500 B	151 B	302 B	131 B	671 B	346 B
Se	(ug)	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	19.7 U	39.4 U	19.7 U
Ag	(ug)	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	1.9 U	0.95 U
Na	(ug)	471 B	463 B	464 B	422 B	296 B	441 B	476 B	485 B	415 B	273 B
Th	(ug)	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	10.9 U	21.8 U	10.9 U
V	(ug)	1.5 U	1.5 U	4.9 B	3.7 B	3.4 B	1.5 U	2.4 B	1.5 U	5.6 B	1.9 B
Zn	(ug)	34.8	25.8	62	47.2 J	48.4 J	22.6	33.1	33.6	52 J	32.6 J

LE 10

CANON CITY HI-VOL VOLUME CALCULATION SPREADSHEET T08-9410-014 slucalcs wk3

HI-VOL	CALIBRATION COEFFICIENTS	
1	0.7765	-0.5538
2	0.58886	0.028114
3	0.610554	0.054508
4	0.623569	0.017661
5	0.611638	0.079183
6	0.638345	-0.08149
7	0.629185	-0.01299
8	0.614168	-0.02454

(CALCULATE THE AVERAGE TEMPERATURE FOR EACH DAY)

DATE	TEMP	BP
8/16/94	24.89	831.05
8/17/94	25.47	831.29
8/18/94	25.47	831.29
8/23/94	25.55	833.01
8/24/94	26.02	832.89

NOTE: The calculated Qstd is less than 50 cfm due to the average temperature for the 24 hour period being lower than the temperature at which the flow rate settings were calculated.

(CALCULATE THE AVERAGE FLOW RATE PER SAMPLER PER DAY)

CONTAMINANT CONCENTRATIONS

SAMPLER	SAMPLE #	LOCATION	INITIAL PRESSURE (DELTA P)	FINAL PRESSURE (DELTA P)	AVERAGE PRESSURE (DELTA P)	AVERAGE FLOW RATE Qr CMM	Qr CFM	TA K	PA MMHg	Qstd CMM	TIME MIN	V STD M(3)	Qstd CFM	Pb ug	Pb ug/m(3)	Zn ug	Zn ug/m(3)
8/16/94																	
1	CC-A-1	E	5.33	3.90	4.62	1.293	45.65	297.89	623.34	1.428	1421.1	2028.78	50.40	147	0.072	413	0.204
2	CC-A-6	NE	4.23	4.30	4.27	1.244	43.93	297.89	623.34	1.374	1421.1	1952.04	48.49	94.5	0.048	145	0.074
3	CC-A-11	N	3.76	3.50	3.63	1.218	42.99	297.89	623.34	1.344	1440	1935.95	47.46	133	0.069	100	0.052
4	CC-A-16	NW	3.80	3.80	3.80	1.233	43.54	297.89	623.34	1.361	1431.8	1949.35	48.07	44.5	0.023	79.1	0.041
5	CC-A-21	DUPLICATE	3.60	3.35	3.47	1.219	43.03	297.89	623.34	1.346	1432.2	1927.33	47.51	31.4	0.016	58.5	0.030
6	CC-A-26	ENE FAR	4.28	5.00	4.64	1.294	45.67	297.89	623.34	1.428	1455.2	2078.13	50.42	11.6 B	0.006	33.9	0.016
7	CC-A-31	N FAR	3.96	4.10	4.03	1.250	44.13	297.89	623.34	1.380	1419	1958.35	48.72	10 U	BDL	34.8	0.018
8	CC-A 36	W FAR	4.23	4.30	4.27	1.244	43.91	297.89	623.34	1.373	1419.3	1948.96	48.48	10 U	BDL	22.6	0.012
8/17/94																	
1	CC-A-2	E	5.52	5.00	5.26	1.379	48.67	298.47	623.52	1.523	1393	2121.92	53.78	40.2	0.019	289	0.136
2	CC-A-7	NE	4.46	4.30	4.38	1.261	44.50	298.47	623.52	1.393	1421.1	1979.22	49.17	72.9	0.037	92	0.046
3	CC-A-12	N	3.98	3.80	3.89	1.259	44.44	298.47	623.52	1.391	1435	1995.73	49.10	123	0.062	92.1	0.046
4	CC-A-17	NW	4.04	4.30	4.17	1.291	45.58	298.47	623.52	1.426	1407.6	2007.88	50.36	22.1	0.011	50.9	0.025
5	CC-A-22	DUPLICATE	3.80	3.70	3.75	1.264	44.61	298.47	623.52	1.396	1408	1965.81	49.29	13.8	0.007	42.6	0.022
6	CC-A-27	ENE FAR	4.49	4.80	4.65	1.294	45.69	298.47	623.52	1.430	1414.8	2023.26	50.49	10.6 B	0.005	31.2	0.015
7	CC-A-32	N FAR	4.17	4.20	4.19	1.274	44.98	298.47	623.52	1.408	1414.8	1991.78	49.70	10 U	BDL	25.8	0.013
8	CC-A-37	W FAR	4.46	4.00	4.23	1.239	43.73	298.47	623.52	1.369	1416.2	1938.14	48.32	10 U	BDL	33.1	0.017
8/18/94																	
1	CC-A-3	E	5.52	4.00	4.76	1.313	46.35	298.47	623.52	1.451	1458	2114.94	51.21	61.6	0.029	191	0.090
2	CC-A-8	NE	4.46	4.30	4.38	1.261	44.50	298.47	623.52	1.393	1376.4	1916.97	49.17	54.4	0.028	86	0.045
3	CC-A-13	N	3.98	4.70	4.34	1.326	46.83	298.47	623.52	1.466	1452	2128.06	51.74	92.8	0.044	84.3	0.040
4	CC-A-18	NW	4.04	3.80	3.92	1.252	44.21	298.47	623.52	1.384	1390.2	1923.53	48.85	41.3	0.021	69.2	0.036
5	CC-A-23	DUPLICATE	3.80	3.70	3.75	1.264	44.61	298.47	623.52	1.396	1390	1940.68	49.29	40.2	0.021	69.5	0.036
6	CC-A-28	ENE FAR	4.49	5.20	4.85	1.324	46.73	298.47	623.52	1.462	1443	2110.31	51.63	10 U	BDL	27.2	0.013
7	CC-A-33	N FAR	4.17	4.00	4.09	1.259	44.44	298.47	623.52	1.391	1441	2004.03	49.10	18.3	0.009	62	0.031
8	CC-A-38	W FAR	4.46	4.50	4.48	1.275	45.03	298.47	623.52	1.409	1438	2026.43	49.75	10 U	BDL	33.6	0.017
8/23/94																	
1	CC-A-4	E	5.55	4.50	5.03	1.348	47.60	298.55	624.81	1.488	1442	2146.01	52.54	16.3	0.008	97.5	0.045
2	CC-A-9	NE	4.48	3.80	4.14	1.226	43.29	298.55	624.81	1.354	1459.6	1975.84	47.79	16.7	0.008	65.5 J	0.033 J
3	CC-A-14	N	4.00	3.20	3.60	1.213	42.82	298.55	624.81	1.339	1451	1942.87	47.27	127	0.065	153	0.079
4	CC-A-19	NW	4.07	3.60	3.84	1.239	43.74	298.55	624.81	1.368	1429	1954.20	48.28	25.7	0.013	71.1 J	0.036 J
5	CC-A-24	DUPLICATE	3.82	2.90	3.36	1.200	42.38	298.55	624.81	1.325	1431	1896.18	46.78	23.6	0.012	68.3 J	0.036 J
6	CC-A-29	ENE FAR	4.62	4.20	4.36	1.251	44.18	298.55	624.81	1.381	1432	1978.23	48.77	13.5	0.007	45.7 J	0.023 J
7	CC-A-34	N FAR	4.19	3.70	3.95	1.237	43.66	298.55	624.81	1.365	1451	1980.92	48.20	10 U	BDL	47.2 J	0.024 J
8	CC-A-39	W FAR	3.95	3.00	3.48	1.120	39.55	298.55	624.81	1.237	1454	1798.26	43.66	20 U	BDL	52 J	0.029 J
8/24/94																	
1	CC-A-5	E	5.50	4.60	5.05	1.351	47.71	299.02	624.72	1.493	1422	2123.22	52.71	23.3	0.011	188	0.089
2	CC-A-10	NE	4.50	3.80	4.15	1.228	43.34	299.02	624.72	1.356	1419	1924.80	47.89	27.4	0.014	57.6 J	0.030 J
3	CC-A-15	N	4.00	3.80	3.90	1.260	44.49	299.02	624.72	1.392	1425	1984.17	49.16	197	0.099	144	0.073
4	CC-A-20	NW	4.10	4.20	4.15	1.288	45.47	299.02	624.72	1.423	1421	2022.12	50.24	39.6	0.020	105	0.052
5	CC-A-25	DUPLICATE	3.80	3.30	3.55	1.232	43.48	299.02	624.72	1.361	1420	1932.25	48.04	33.9	0.018	95.6	0.049
6	CC-A-30	ENE FAR	4.50	4.70	4.60	1.288	45.46	299.02	624.72	1.423	1426	2028.66	50.23	10 U	BDL	43.5 J	0.021 J
7	CC-A-35	N FAR	4.20	3.90	4.05	1.253	44.24	299.02	624.72	1.385	1431	1981.41	48.88	21.3	0.011	48.4 J	0.024 J
8	CC-A-40	W FAR	4.50	3.50	4.00	1.204	42.50	299.02	624.72	1.330	1434	1907.26	46.96	10 U	BDL	32.6 J	0.017 J

TABLE 11

canondir.wk3

T08-9410-014

COLLEGE OF THE CANONS WIND DIRECTION VS. LOADING

	SAMPLE #	LOCATION	Pb ug/m(3)	PB ug	Zn ug	Zn ug/m(3)
8/16/94	**WIND FROM WSW, SW (Windy)**					
COLLEGE	CC-A-1	DOMINANT	0.072	147	413	0.204
BUS.PARK	CC-A-6	DOMINANT	0.048	94.5	145	0.074
MARIPOSA	CC-A-11	DOMINANT	0.069	133	100	0.052
RED PILES	CC-A-16	SECONDARY	0.023	44.5	79.1	0.041
RED PILES	CC-A-21	SECONDARY	0.016	31.4	58.5	0.030
FOREST SVC	CC-A-26	SECONDARY	0.006	11.6 B	33.9	0.016
DUMP	CC-A-31	BACKGROUND	BDL	10 U	34.8	0.018
AUTO SLVG	CC-A-36	BACKGROUND	BDL	10 U	22.6	0.012
8/18/94	**WIND FROM WSW, SW (Moderate)**					
COLLEGE	CC-A-2	DOMINANT	0.019	40.2	289	0.136
BUS.PARK	CC-A-7	DOMINANT	0.037	72.9	92	0.046
MARIPOSA	CC-A-12	DOMINANT	0.062	123	92.1	0.046
RED PILES	CC-A-17	SECONDARY	0.011	22.1	50.9	0.025
RED PILES	CC-A-22	SECONDARY	0.007	13.8	42.6	0.022
FOREST SVC	CC-A-27	SECONDARY	0.005	10.6 B	31.2	0.015
DUMP	CC-A-32	BACKGROUND	BDL	10 U	25.8	0.013
AUTO SLVG	CC-A-37	BACKGROUND	BDL	10 U	33.1	0.017
8/19/94	**WIND FROM SW, WSW (Moderate)**					
COLLEGE	CC-A-3	SECONDARY	0.029	61.6	191	0.090
BUS.PARK	CC-A-8	DOMINANT	0.028	54.4	86	0.045
MARIPOSA	CC-A-13	DOMINANT	0.044	92.8	84.3	0.040
RED PILES	CC-A-18	DOMINANT	0.021	41.3	69.2	0.036
RED PILES	CC-A-23	DOMINANT	0.021	40.2	69.5	0.036
FOREST SVC	CC-A-28	DOMINANT	BDL	10 U	27.2	0.013
DUMP	CC-A-33	PERIPHERIAL	0.009	18.3	62	0.031
AUTO SLVG	CC-A-38	BACKGROUND	BDL	10 U	33.6	0.017
8/23/94	**WIND FROM NE, WSW (Moderate)**					
COLLEGE	CC-A-4	SECONDARY	0.008	16.3	97.5	0.045
BUS.PARK	CC-A-9	SECONDARY	0.008	16.7	65.5 J	0.033 J
MARIPOSA	CC-A-14	SECONDARY	0.065	127	153	0.079
RED PILES	CC-A-19	PERIPHERIAL	0.013	25.7	71.1 J	0.036 J
RED PILES	CC-A-24	PERIPHERIAL	0.012	23.6	68.3 J	0.036 J
FOREST SVC	CC-A-29	PERIPHERIAL	0.007	13.5	45.7 J	0.023 J
DUMP	CC-A-34	BACKGROUND	BDL	10 U	47.2 J	0.024 J
AUTO SLVG	CC-A-39	BACKGROUND	BDL	20 U	52 J	0.029 J
8/24/94	**WIND FROM SW, E (Strong)**					
COLLEGE	CC-A-5	SECONDARY	0.011	23.3	188	0.089
BUS.PARK	CC-A-10	DOMINANT	0.014	27.4	57.6 J	0.030 J
MARIPOSA	CC-A-15	DOMINANT	0.099	197	144	0.073
RED PILES	CC-A-20	DOMINANT	0.020	39.6	105	0.052
RED PILES	CC-A-25	DOMINANT	0.018	33.9	95.6	0.049
FOREST SVC	CC-A-30	DOMINANT	BDL	10 U	43.5 J	0.021 J
DUMP	CC-A-35	PERIPHERIAL	0.011	21.3 U	48.4 J	0.024 J
AUTO SLVG	CC-A-40	SECONDARY	BDL	10 U	32.6 J	0.017 J

APPENDIX A

SAMPLING ACTIVITIES REPORT

TARGET INFORMATION
COLLEGE OF THE CANYONS SMELTER SITE
CANON CITY, COLORADO
TDD #S T08-9406-0008 AND T08-9406-0501

Prepared for:

U.S. Environmental Protection Agency
Region VIII, Denver, Colorado
Mike Zimmerman, On-Scene Coordinator
Pat Smith, Site Assessment Manager

Prepared by:

Ecology and Environment, Inc.
Technical Assistance Team
Scott Keen, Project Manager

Date Submitted: July 25, 1994

CERCLA Eligibility Worksheet

Site Name College of the Canyons Smelter Site

City Canon City State Colorado

EPA ID Number COD116263781

Note: The site is automatically CERCLA eligible if it is a Federally owned or operated RCRA site.

I. CERCLA Eligibility

Did the facility cease operations prior to November 19, 1980? Yes

If YES, then STOP. The facility is probably a CERCLA site.
If NO, continue to part II

II. RCRA Deferral Factors

Did the facility file a RCRA Part A application?

If YES:

1. Does the facility currently have interim status?
2. Did the facility withdraw its Part A application?
3. Is the facility a known or possible protective filer? (filed in error)
4. Does the facility have a RCRA operating or post closure permit?
5. Is the facility a later (after 11/19/80) or non-filer that has been identified by the EPA or the State? (facility did not know it needed to file under RCRA)

Type of facility:

Generator _____ Transporter _____ Recycler _____
TSD (Treatment/Storage/Disposal) _____

If all answers to questions 1, 2, and 3 are NO, STOP. The facility is a CERCLA eligible site.

If answer to #2 or #3 is YES, STOP. The facility is a CERCLA eligible site.

If answer to #2 and #3 are NO and any other answer is YES, site is RCRA, continue to part III.

III. **RCRA Sites Eligible for the NPL**

Has the facility owner filed for bankruptcy under Federal or State laws? No

Has the facility lost RCRA authorization to operate or shown probable unwillingness to carry out correction action? No

Is the facility a TSD that converted to a generator, transporter or recycler facility after November 19, 1980? No

IV. **Exempted substances:**

Does the release involve hazardous substances other than petroleum? Yes

V. **Other programs: The site may never reach the NPL or be a candidate for removal. We need to be able to refer it to any other programs in EPA or state agencies that may have jurisdiction, and thus be able to effect a cleanup. Responses should summarize available information pertaining to the question. Include information in existing files in these programs as part of the PA. Answer all that apply.**

Is there an owner or operator?

Yes, there are currently several owners. The New Jersey Zinc Company was the first and longest owner and operator.

NPDES-CWA: Is there a discharge water containing pollutants with surface water through a point source (pipe, ditch, channel, conduit, etc.)?

There is no point source; however, run-off from an approximate 7-acre area is acidic and contains numerous metal contaminants.

CWA (404): Have fill or dredged material been deposited in a wetland or on the banks of a stream? Is there evidence of heavy equipment operating in ponds, streams or wetlands?

No.

UIC-SDWA: Are fluids being disposed of to the subsurface through a well, cesspool, septic system, pit, etc.?

No.

TSCA: Is it suspected that there are PCBs on the site that came from a source with greater than 50 ppm PCBs, such as oil from electrical transformers or capacitors?

No.

FIFRA: Is there a suspected release of pesticides from a pesticide storage site? Are there pesticide containers on site?

No.

RCRA (D): Is there an owner or operator who is obligated to manage solid waste storage or disposal units under State solid waste or ground water regulations?

No.

UST: Is it suspected that there is a leaking underground storage tank containing a product which is a hazardous substance or petroleum?

No.

PA WORKSHEET

Site Name College of the Canyons Smelter Site City, State Canon City, Colorado

CERCLIS ID # COD116263781

Reported by Scott Keen Date July 18, 1994

HIGHLIGHTS:

A) **IS THERE QUALITATIVE OR QUANTITATIVE EVIDENCE OF A RELEASE TO AIR, SURFACE WATER, GROUND WATER, OR SURFACE SOIL? DESCRIBE BRIEFLY. More detail in items GW-1 (for GW), SW-5 (for SW), A-1 (for air), and SE-1 (for soil exposure pathway).**

There is currently no analytical evidence of contaminant releases from the site. Erosion of waste materials, however, does suggest solubilization or physical transport of particulate material and subsequent releases to the surface water pathway. Dusty conditions have been noted during past (1991) activities at the site, suggesting possible contaminant releases via the air pathway. The likelihood of releases to ground water targets appears remote, and there appears to be minimal opportunity for the soil exposure pathway.

B) **IS THERE EVIDENCE OF AN IMPACTED TARGET POPULATION? DESCRIBE.**

Pathway	Target	none/target size	Brief description	More discussion in
Ground Water	public drinking water supply	None		
	domestic drinking water supply	None		
Surface Water	drinking water	None		
	fishery	Arkansas River	Cold water fishery	SW-5; T-3
	sensitive environment	Wetland T&E habitat	Wetland areas and bald eagle habitat	SW-5; T-3
Soil Exposure	people w/in 200'			
	terrestrial sens. env.	None		
Air	population	None		

SITE INFORMATION

G-1. Directions to the site (from nearest easily recognized point).

From Highway 50, turn south on 9th Street in Canon City; turn right (west) on Highland Avenue turn left (south) on Oak Creek Grade Road; after approximately 1/2 mile, turn right on Forge Road; go approximately 1/2 mile to the site.

G-2. Are there other potential sources in the neighborhood to be aware of as the site is evaluated, e.g., Is the site in an industrial area, near a railroad, along a highway? Are sources with similar contaminants to this site in the vicinity?

Yes; when this smelter was built in 1902, there was an existing zinc smelter located 1 mile to the north. At present, this second zinc smelter has not been located; however, "1 mile to the north" could place it in the same surface water run-off pathway as the College of the Canyons site.

Background/Operating History

G-3 Describe the operating history of the site:

The facility operated from 1902 to 1932, and from the early 1940s until 1968 processing between 50 and 90 tons per day of ores mined and milled at the Eagle Mine in Gilman, Colorado. Plant processes included magnetic separation, roasting/oxidation, and flotation for the concentration of zinc and lead.

Source of information: Canon City Public Library, Local History Center

G-4. Describe site and nature of operations (property size, manufacturing, waste disposal, storage, etc.):

Approximately 7 acres of the area is currently covered with waste material, including waste piles, sediment-filled and dry tailings ponds, and contaminated soil near the old smelter location.

Source of information: U.S. EPA and TAT site visits; aerial photographs

G-5. Describe any emergency or remedial actions that have occurred at the site:

U.S. EPA Emergency Response Branch conducted a drum removal in 1991; however, this action was unrelated to current concerns regarding contaminated soils. No other emergency or remedial actions have occurred.

Source of information: U.S. EPA files

G-6. **Are there records or knowledge of accidents or spills involving site wastes? Are there Emergency Response Notification (ERNs) reports for this location?**

Yes; June 1994 ERNS report regarding possible heavy metal contamination in an abandoned smelter location. Also, July 1991 ERNS report regarding alleged dumping of 150 drums on site.

Source of information:

G-7. **Describe existing sampling data and briefly summarize data quality (e.g., sample objective, age/comparability, analytical methods, detection limits, QA/QC, validatability):**

Seventeen site and background soil samples were collected and analyzed by X-ray fluorescence by the TAT in June 1994. Although data is believed to be of high quality, no laboratory confirmation samples were collected and data was not validated. Sampling objectives were to quickly acquire knowledge of potential contaminants. The data revealed numerous metal contaminants at high concentrations.

Source of information: TAT files

G-8. **Is there any other local, state or federal regulatory involvement? Describe. Include permits and names of contact individuals within each government organization.**

AGENCY	PROGRAM	CONTACT	PHONE	PERMIT
There is currently no other local, state, or federal regulatory involvement.				

G-9. **Attach site sketch or schematic. Include all pertinent features including wells, storage areas, underground storage tanks, source areas, buildings, access roads, areas of ponded water. Refer to figure(s) submitted with text of report if appropriate.**

SOURCE CHARACTERIZATION

WC-1 Describe each source at the site, on Table 1, in terms of source type, containment, size/area/volume/quantity, and substances present. See HRS Tables 2-5 and 5-2 for source descriptions. Tables 3-2, 4-2, 4-8, 5-6, 6-3, and for containment.

The site is approximately 7 acres of contaminated soil, waste piles, and tailings ponds; however, because of many years of inactivity, there are no longer distinct waste sources on site. The site is characterized as 7 acres of contaminated soil.

WC-2 Briefly describe how waste quantity was estimated (e.g., historical records or manifests, permit applications, air photo measurements, etc.):

The local newspaper, reporting on the sale of the New Jersey Zinc Company property in 1969, stated that the sale included "60,000 tons of zinc plant tailings."

Source of information: Canon City Public Library, Local History Center

WC-3 Describe any restrictions or barriers to accessibility of on-site sources.

The site is approximately 1 to 2 miles south of Canon City in an unpopulated area. Except for the site's isolated location, there are not barriers that limit accessibility of on-site contaminant sources.

Source of information: U.S. EPA and TAT site visits

GROUND WATER CHARACTERISTICS

GW-1. Any positive or circumstantial evidence of a release to ground water? Describe.

No; metal contaminants tend not to be very mobile in ground water. In this case, however, acidic conditions could increase mobility. Shallow ground water in the area likely moves north/northeast towards the Arkansas River. Ground water to surface water pathway is possible, but not probable. City water supply exists in the entire area between the site and the Arkansas River.

Source of information:

GW-2. Any positive or circumstantial evidence of a release to drinking water users? Describe analytes, detection limits, background, hits, number of users, locations, QA/QC.

No.

Source of information:

GW-3. Briefly describe the geologic setting.

Quaternary alluvial soils above Pierre shale.

GW-4. Describe geologic/hydrogeologic units on Table 2. Give names, descriptions, and characteristics of consolidated and unconsolidated zones beneath the site.

Complete information is unavailable at the time of preparation of this worksheet. Geologic units of concern, however, are alluvial soils underlain by the Pierre shale. Shallow ground water moving toward the Arkansas River is likely present in alluvial soils.

GW-5. Is the site in an area of karst terrain or a karst aquifer?

No.

GW-6. Net Precipitation (per HRS section 3.1.2.2).

4.6 inches

SURFACE WATER CHARACTERISTICS

SW-1. Mean annual precipitation (per HRS section 4.0.2) = 12-16 inches **. If less than 20", count intermittent channels as surface water.**

SW-2. Discuss the probable surface water flow pattern from the site to surface waters:

Three ditches collect surface run-off. These ditches meet and join approximately 1/2 mile north of the site. Combined flow travels approximately 3/4 mile and enters the Arkansas River between 1st Street and Centennial Park.

Source of information: TAT site visit

SW-3. If surface water exists within 2 miles of the site, describe surface water segments within the 15-mile distance limit.

Segment Name	River/ Lake/ type	Fresh/ Salt Water	Start (mi.)	End (mi)	flow in cfs
Ditches	Intermittent ditches	Fresh	0	1/3	Intermittent
Forked Gulch	Perennial stream	Fresh	1/3	1 1/3	10
Arkansas River	River	Fresh	1 1/3	15	800

Ground water to surface water distance .5 - .75 mile Angle θ 173°

SW-4. Provide a schematic diagram or simple figure that describes surface water segments, locates targets, identifies flow direction, PPE(s), etc. Refer to figure(s) submitted with text of report if appropriate.

SW-5. Any positive or circumstantial evidence of a release to surface water? Evidence of a release by direct observation? Is the source located in surface water? Describe.

Although located in a semiarid climate and approximately 1 1/2 miles from the Arkansas River, there appears to be a very direct route and means for the migration of contaminants to the river. Rainfall and/or snowmelt conditions can carry particulate metals through drainages to the river; and highly acidic conditions that occur when rainfall or snowmelt contact contaminated soils will cause solubilization of metals and subsequent migration of contaminants.

Source of information:

SW-6. Any positive or circumstantial evidence of a release to surface water target populations? Describe analytes, detection limits, background, hits, number of users, locations, QA/QC.

No; however, erosion of waste materials suggests the transport of metal contaminants from the site by solubilization or by the physical movement of particulate material.

Source of information:

SW-7. Is the site or portions thereof located in surface water? No

Is the site located in the:	< 10 yr flood plain?	No
	> 10-100 yr flood plain?	No
	> 100-500 yr flood plain?	
	> 500 yr flood plain?	

SW-8. Two-year 24-hour rainfall 1.5 - 2.0 inches

TARGETS

T-1. Discuss ground water usage within four miles of the site:

Minimal use of shallow ground water between the site and the Arkansas River due to the availability of municipal supply. Attached Figure shows applications and permits for "domestic" wells in the area of concern. Only one well, located approximately 3/4 mile north/northeast of the site in the northwest quarter of the northeast quarter of Section 5 appears to be hydrogeologically downgradient to the site.

Source of information: Colorado Division of Water Resources, Engineer's Office

T-2. Summarize the drinking water population served via ground water within 4 miles of the site:

0 - 1/4 mi	0
1/4 - 1/2 mi	0
1/2 - 1 mi	0 - 25*
1 - 2 mi	0 - 100*
2 - 3 mi	
3 - 4 mi	

* Estimates based on the number of permitted "domestic" wells. Because of the availability of a municipal supply, it is unlikely that any ground water is used for drinking purposes within 2 miles of the site.

Attach calculations for population apportionment in blended systems.

T-3. Identify and locate any of the following surface water targets within 15 miles of the site: drinking water population(s) served by intakes, fisheries, sensitive environments described in Table 4-23 of the HRS, and wetlands as defined in the Federal Register.

Targets	Dist. from site	SW body	Flow in cfs	Population served/size (inc. units)	Contamination known/Suspected
City of Florence drinking water	8 (est)	Arkansas River	800	2,990 people	Not known; not suspected
Fishery	1 1/3 (est)	Arkansas River	800		Suspected
Wetlands	1 (est)	Forked Gulch Arkansas River	10 800		Suspected
Habitat used by bald eagles	1 1/3 (est)	Arkansas River	800		Suspected

T-4. Summarize the population within a four-mile radius of the site:

	Total pop.	Worker pop.
on site	0	0
0 - 1/4 mi	40 - 55 (all workers)	
1/4 - 1/2	175 - 220 (all workers)	
1/2 - 1 mi	500 - 1,000*	
1 - 2 mi	2,000 - 2,500*	
2 - 3 mi	4,500 - 5,500*	
3 - 4 mi	5,000 - 6,000*	

* Estimates based on the following population densities:

Canon City: 1,606 people per square mile
Brookside: 458 people per square mile
Lincoln Park: 981 people per square mile

T-5. Identify and locate any terrestrial sensitive environments described in Table 5-5 of the HRS.

No terrestrial sensitive environments exist on the 7 acres of the site or within the 4-mile radius of the site.

T-6. Describe any positive or circumstantial evidence of a release to air target populations? Of a release by direct observation where target population exists within 1/4 mile of the site? Describe analytes, detection limits, background, hits, number of users, locations, QA/QC.

There is no recent evidence of a release to air target populations. Dusty conditions do not occur unless waste material is disturbed by vehicle traffic, in which case considerable particulate material can be released to the air pathway. Air targets are minimal within 1/2 mile of the site.

T-7. Identify and locate any potential or known resident soil exposure populations, if present. Describe conditions which lead the researcher to suspect contaminated soil within 200' of residences, if this condition exists.

No resident soil exposure populations or residences exist within 200 feet of the site.

TABLE 1
WASTE CONTAINMENT AND HAZARDOUS SUBSTANCE IDENTIFICATION[1]

PATHWAY - SOURCE TYPE	SIZE (volume/area)	ESTIMATED WASTE QUANTITY	SPECIFIC COMPOUNDS	CONTAINMENT[2]	SOURCES OF INFORMATION
Surface water pathway contaminated soil	7 acres	60,000 tons	Nickel, copper, zinc, mercury, lead, chromium, cadmium	No containment; no run-off control	Site visit
Ground water pathway contaminated soil	7 acres	60,000 tons	Nickel, copper, zinc, mercury, lead, chromium, cadmium	No containment; no liners	Site visit
Air migration pathway contaminated soil	7 acres	60,000 tons	Nickel, copper, zinc, mercury, lead, chromium, cadmium	No containment; no vegetative cover; no uncontaminated soil cover	Site visit

[1] Use additional sheets if necessary.

[2] Evaluate containment of each source from the perspective of each migration pathway (e.g., ground water pathway - non-existent, natural or synthetic liner, corroding underground storage tank; surface water - inadequate freeboard, corroding bulk tanks; air - unstabilized slag piles, leaking drums, etc.).

TABLE 2

HYDROGEOLOGIC INFORMATION[1]

STRATA NAME/ DESCRIPTION	THICKNESS (ft.)	HYDRAULIC CONDUCTIVITY (cm/sec)	TYPE OF DISCONTINUITY[2]	SOURCE OF INFORMATION

[1] Use additional sheets if necessary.

[2] Identify the type of aquifer discontinuity within four miles of the site (e.g., river, strata, "pinches out", etc.).

EPA POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT FORM

Identification

State: CO

CERCLIS Number: COD116263781

CERCLIS Discovery Date:

1. General Site Characteristics

Name: College of the Canyons Smelter Site

Street Address: Forge Road

City: Canon City State: CO Zip Code: County: Fremont Co.Code: Cong.Dist.:

Latitude: 38 ° 24 ' 43 "

Longitude: 105 ° 14 ' 58 "

Approximate Area of Site: 7 Acres _____ Square Ft.

Status of Site: ☐ Active ■ Inactive ☐ Not Specified ☐ NA (GW plume, etc.)

2. Owner/Operator Information

Owner: City of Canon City	Operator: New Jersey Zinc Company
Street Address:	Street Address:
City:	City:
State: Zip Code: Telephone: ( )	State: Zip Code: Telephone: ( )
Type of Ownership: ■ Private ☐ Federal Agency Name _____ ☐ State ☐ Indian ☐ County ■ Municipal ☐ Not Specified ☐ Other _____	How Initially Identified: ☐ Citizen Complaint ☐ PA Petition ■ State/Local Program ☐ RCRA/CERCLA Notification ☐ Federal Program ☐ Incidental ☐ Not Specified ☐ Other _____

3. Site Evaluator Information

Name of Evaluator: Scott Keen Agency/Organization: Ecology and Environment, Inc. TAT Date Prepared: July 21, 1994

Street Address: 1776 So. Jackson St., Suite 200 City: Denver State: CO

Name of EPA or State Agency Contact:	Street Address: 999-18th Street
City: Denver	State: CO Telephone: (303)

4. Site Disposition (for EPA use only)

Emergency Response Removal Assessment Recommendation:
☐ Yes
☐ No
☐ Date _____

CERCLIS Recommendation:
☐ Higher Priority SI
☐ Lower Priority SI
☐ NFRAP
☐ RCRA
☐ Other _____
Date _____

Signature:

Name (typed):

Position:

Table 1
College of the Canyons Smelter Site
Metals in Soil (mg/kg), Screening Results by XRF, June 23, 1994
TDD Nos. T08-9406-0008 and T08-9406-0501

Element	Normal Range*	Background CC-SO-14	CC-SO-01	CC-SO-02	CC-SO-03	CC-SO-04	CC-SO-05	CC-SO-06	CC-SO-07	CC-SO 08	CC-SO-09
Chromium	19 - 90	6	368	23	107	288	337	0	11	477	40
Titanium		3574	1488	3565	2501	885	1108	1373	2151	1807	2347
Manganese	192 - 752	805	3164	1574	2445	43930	3909	1862	2129	1042	7961
Iron	10,600 - 41,000	27183	117379	75104	144898	162475	150985	262267	175172	41817	112253
Cobalt	3.6 - 14	62	0	284	1107	0	362	1151	574	341	239
Nickel	7 - 32	0	144	17	0	825	993	0	0	4402	248
Copper	10 - 43	0	621	120	373	1088	6689	101	208	7180	2044
Zinc	31 - 98	638	15732	3731	10172	90043	51317	2816	3211	154831	73630
Arsenic	2.8 - 10.9	12	0	0	579	0	0	0	0	0	0
Selenium	.09 - .56	0	0	0	0	14	30	0	0	29	13
Strontium		532	56	303	45	38	163	90	183	197	306
Zirconium		319	82	420	496	124	135	177	199	271	270
Molybdenum	.39 - 1.85	2.9	26	15	2.6	7	86	5.5	16	83	13
Mercury	.02 - .11	35	75	3.7	22	208	132	123	77	0	69
Lead	9 - 31	87	19525	3300	8220	13859	40354	11534	3708	53160	6556
Rubidium		118	97	85	0	108	98	51	93	84	58
Cadmium	.01 - 2	56	435	114	288	758	378	160	133	307	388
Tin	.4 - 1.9	0	58	13	32	61	617	12	3	885	81
Antimony	.22 - 1.01	8	115	29	29	74	266	25	17	449	48
Barium	337 - 998	700	41	615	125	28	608	185	373	1018	637
Silver	.01 - 8	37	36	65	68	144	50	158	75	107	60
Uranium	1.7 - 3.6	1.2	0	4.5	12	0	4.7	0.2	0	6	0
Thorium	6.1 - 13.6	17	113	28	0	26	33	1.8	25	13	1.0

* Data from: Shacklette, H.T., and Boerngen, J.G.; 1984: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270. 105pp.

Table 1 (continued)
College of the Canyons Smelter Site
Metals in Soil (mg/kg), Screening Results by XRF, June 23, 1994
TDD Nos. T08-9406-0008 and T08-9406-0501

Element	Normal Range*	Background CC-SO-14	CC-SO-10	CC-SO-11	CC-SO-12	CC-SO-13	CC-SO-15	CC-SO-16	CC-SO-17
Chromium	19 - 90	5.5	102	45	0	261	0	0	22
Titanium		3574	1692	979	2086	1308	1760	2616	4879
Manganese	192 - 752	805	2063	2709	1935	2005	24372	12685	1995
Iron	10,600 - 41,000	27183	108200	40457	93431	92657	239405	51303	57747
Cobalt	3.6 - 14	62	588	0	710	288	0	141	125
Nickel	7 - 32	0	70	0	38	0	32	0	0
Copper	10 - 43	0	2022	534	2258	3333	678	448	169
Zinc	31 - 98	638	112461	31990	147926	216395	20062	8273	1253
Arsenic	2.8 - 10.9	12	410	0	148	0	0	0	0
Selenium	.09 - .56	0	0	0	0	0	0	8	6
Strontium		532	282	343	187	117	71	279	309
Zirconium		319	135	70	205	120	274	296	403
Molybdenum	.39 - 1.85	2.9	0	90	0	0	8	5	7
Mercury	.02 - .11	55	105	0	0	178	107	0	46
Lead	9 - 31	87	2552	1244	4866	7316	13104	6470	500
Rubidium		117	51	29	106	97	38	73	70
Cadmium	.01 - 2	56	830	272	1459	2067	367	109	108
Tin	.4 - 1.9	0	25	5	0	94	0	14	12
Antimony	.22 - 1.01	5	69	.1	70	8	54	8	6
Barium	337 - 998	700	373	250	340	218	138	519	534
Silver	.01 - 8	37	173	98	172	278	169	47	51
Uranium	1.7 - 3.6	1.2	0	0	0	0	10	10	2
Thorium	6.1 - 13.6	17	10	3	12	5	25	17	32

* Data from: Shacklette, H.T., and Boerngen, J.G.; 1984: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270. 105pp.

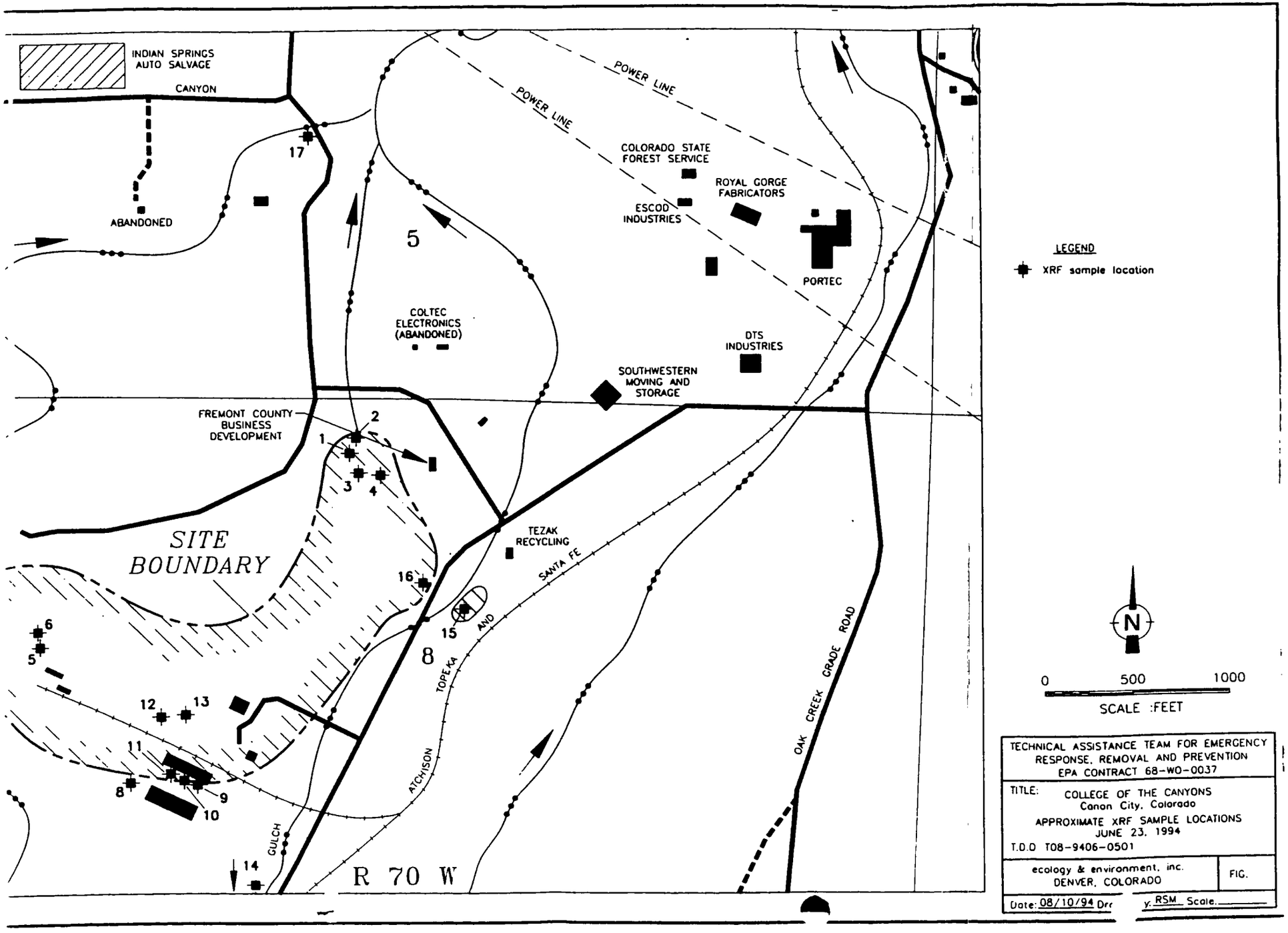
OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

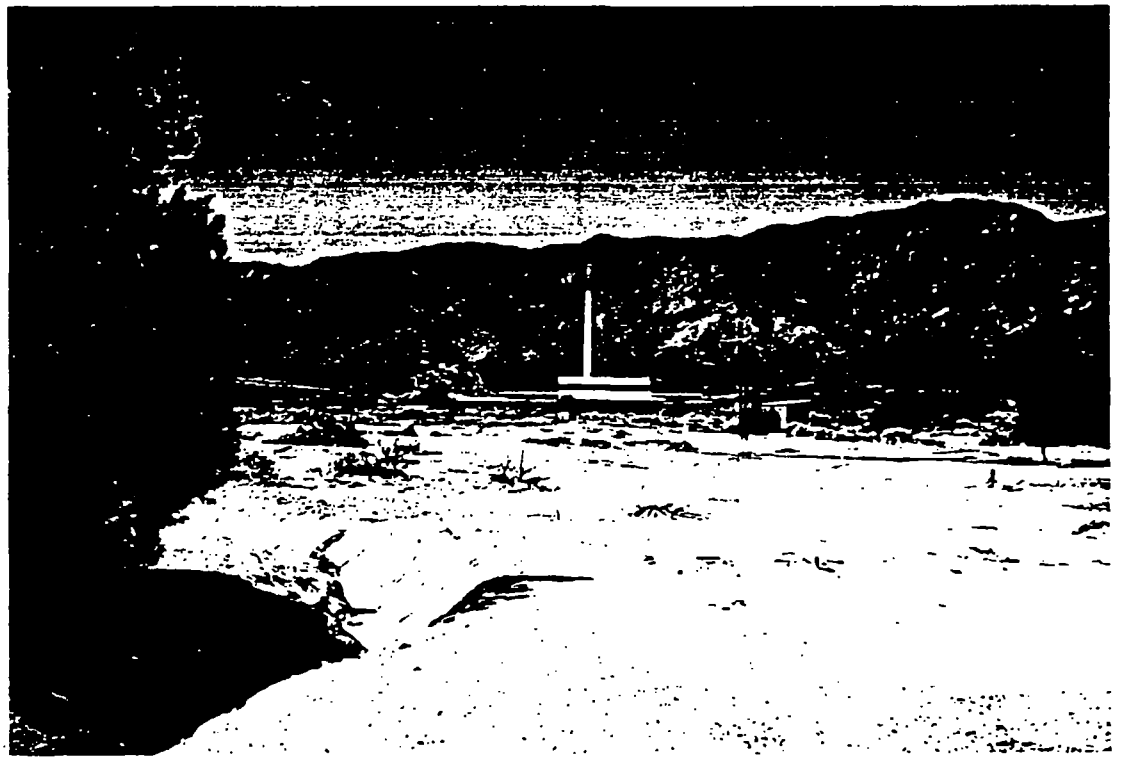
Subject: Sample location CC-SO-04. Drainage path through tailings pond.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: 1005 Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

PH-1

IPHT]9406-008.SK


INDIAN SPRINGS AUTO SALVAGE
CANYON
ABANDONED
17
POWER LINE
POWER LINE
COLORADO STATE FOREST SERVICE
ROYAL GORGE FABRICATORS
ESCOD INDUSTRIES
PORTEC
5
COLTEC ELECTRONICS (ABANDONED)
DTS INDUSTRIES
SOUTHWESTERN MOVING AND STORAGE
FREMONT COUNTY BUSINESS DEVELOPMENT
2
1
3
4
SITE BOUNDARY
TEZAK RECYCLING
SANTA FE
16
15
AND
8
TOPEKA
6
5
12
13
11
8
9
10
ATCHISON
GULCH
14
R 70 W
OAK CREEK GRADE ROAD
LEGEND
XRF sample location
N
0
500
1000
SCALE :FEET
TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037
TITLE: COLLEGE OF THE CANYONS
Canon City, Colorado
APPROXIMATE XRF SAMPLE LOCATIONS
JUNE 23, 1994
T.D.D T08-9406-0501
ecology & environment, inc.
DENVER, COLORADO
FIG.
Date: 08/10/94 Drr
y: RSM Scale.



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

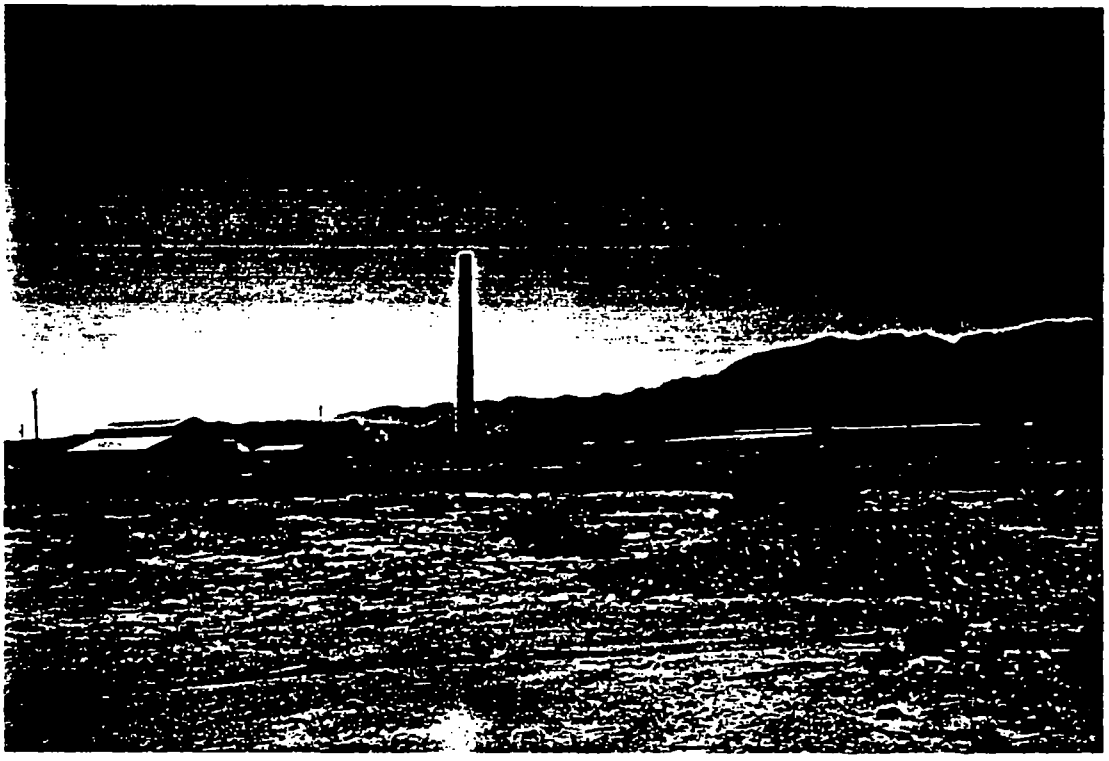
Subject: From east side of tailings, area facing south at stack.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

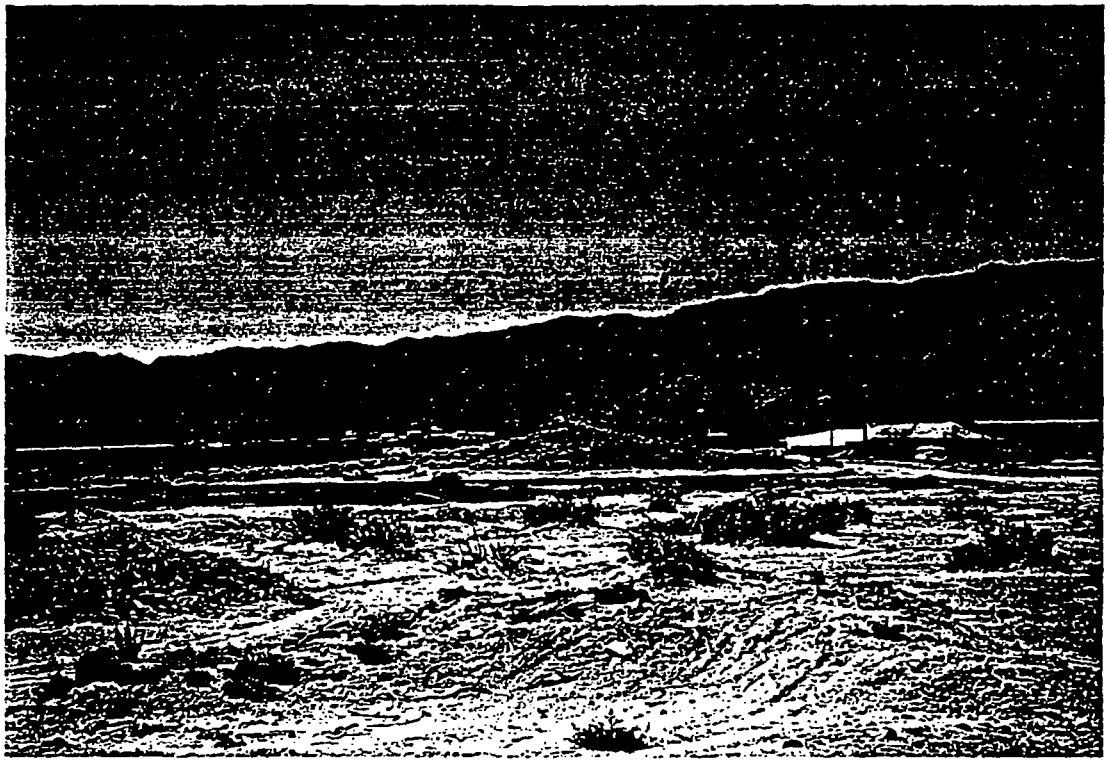
Subject: Facing north/northwest through tailings area.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor



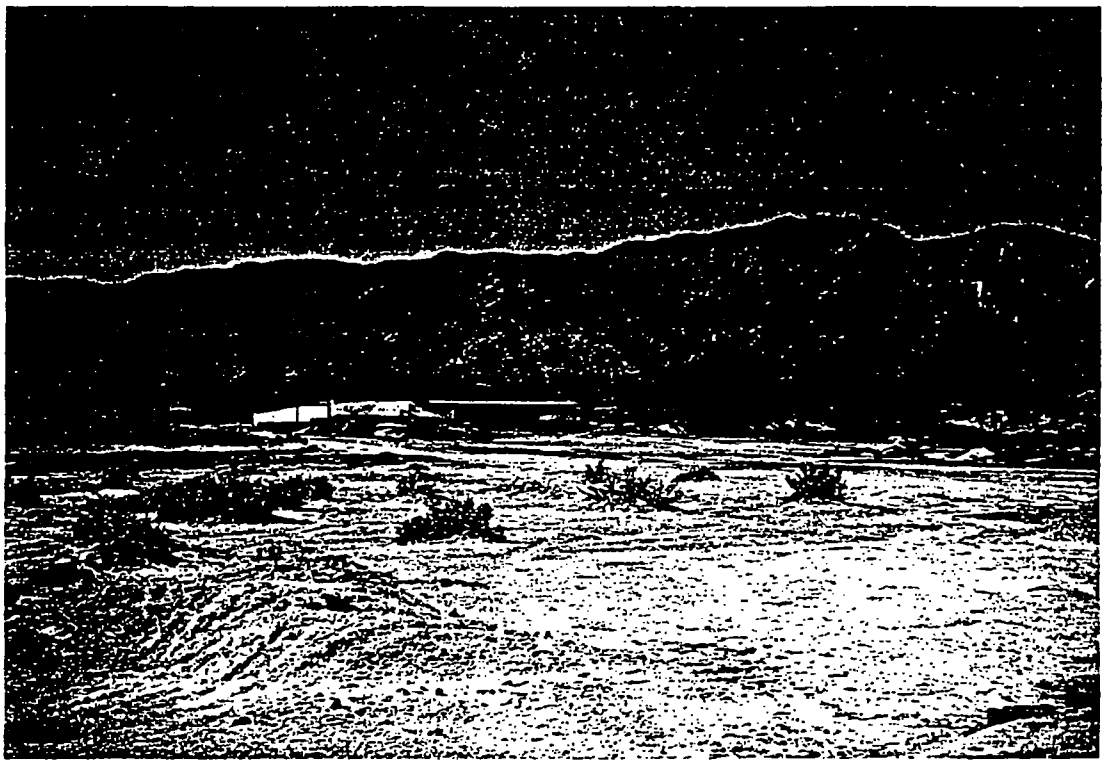
OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: With photos 5, 6, and 7, panorama of site, facing south/ southeast (left to right).
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: With photos 4, 6, and 7, panorama of site, facing south/ southeast (left to right).
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: With photos 4, 5, and 7, panorama of site, facing south/ southeast (left to right).
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

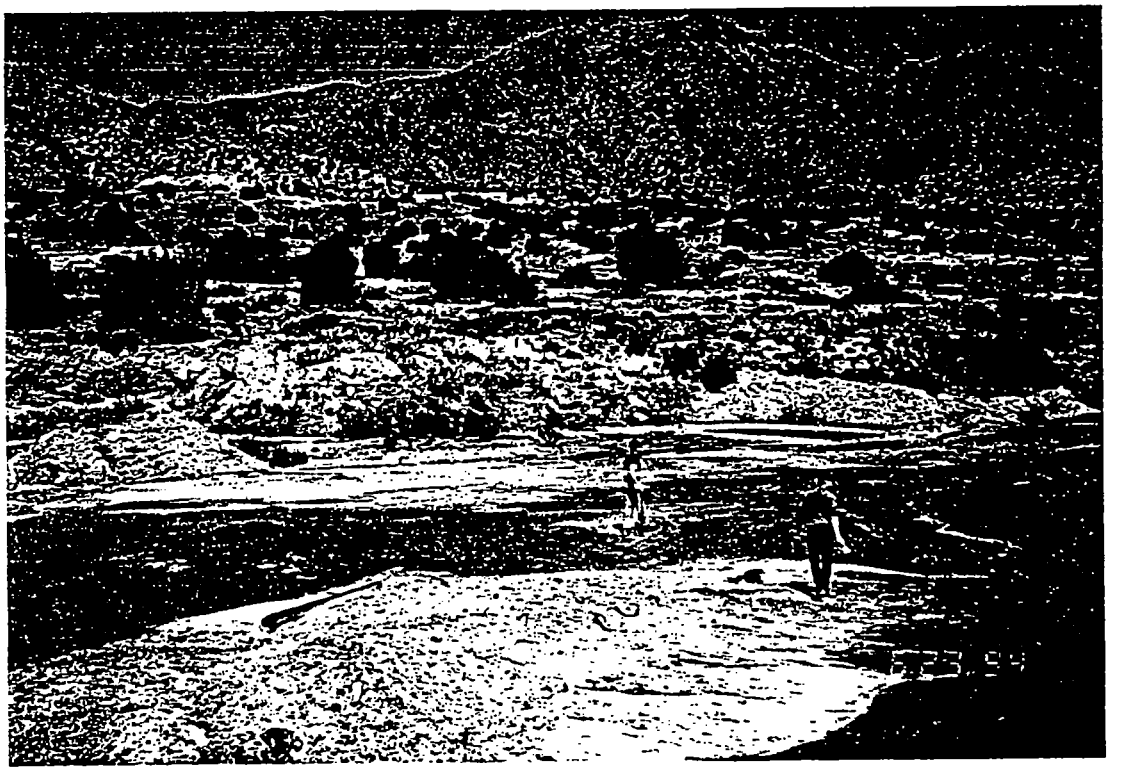
OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: With photos 4, 5, and 6, panorama of site, facing south/ southeast (left to right).
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing south at fertilizer building.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

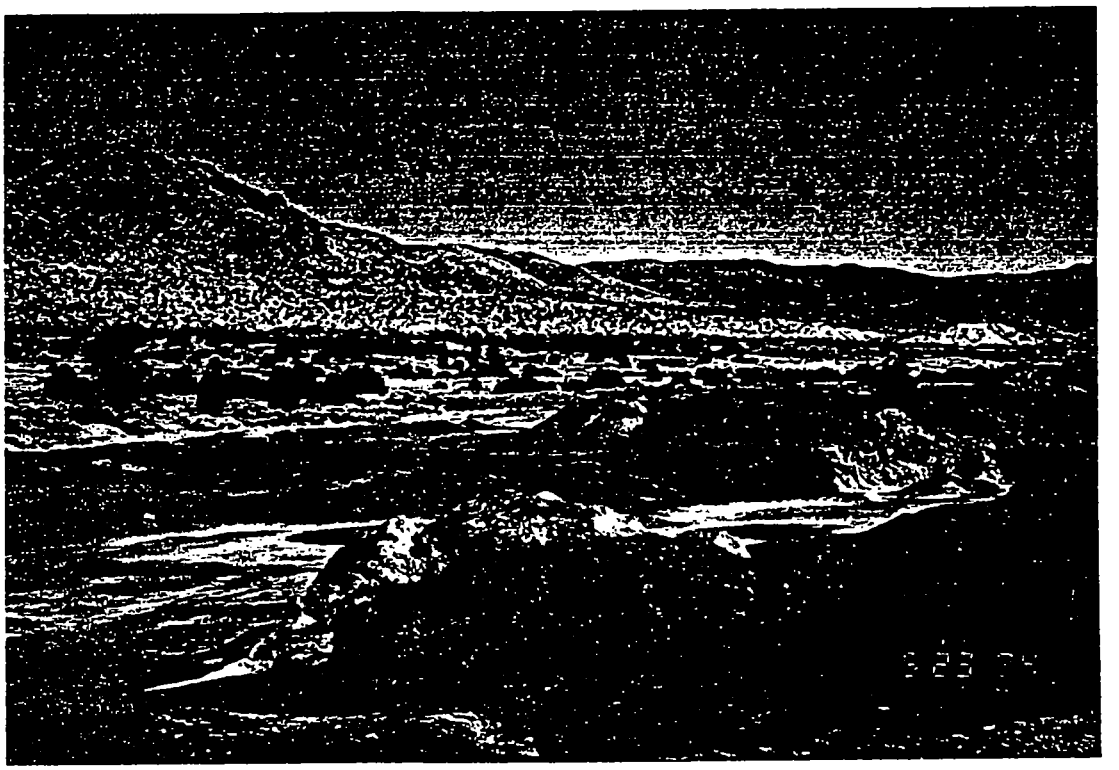


OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing west at drainage along west edge of waste pile area.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

[PHT]9406-008.SK



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing north/northwest at northwest edge of waste pile area.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

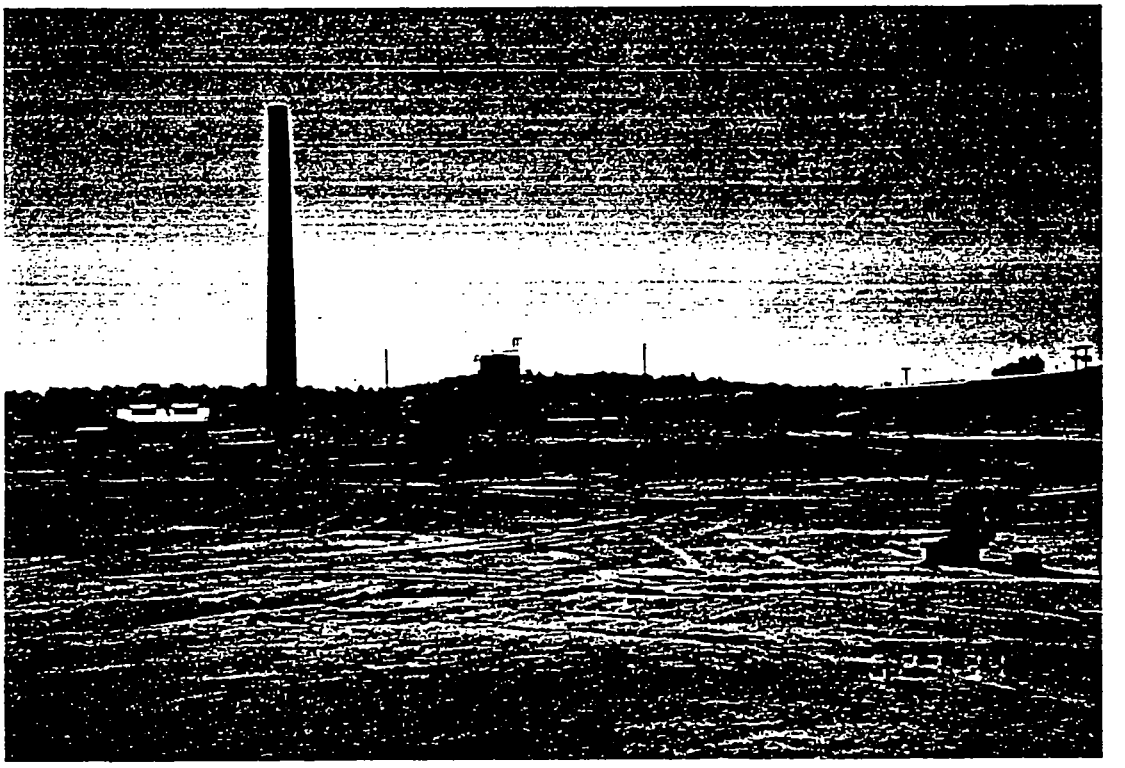
[PHT]9406-008.SK

OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing north from fertilizer building.

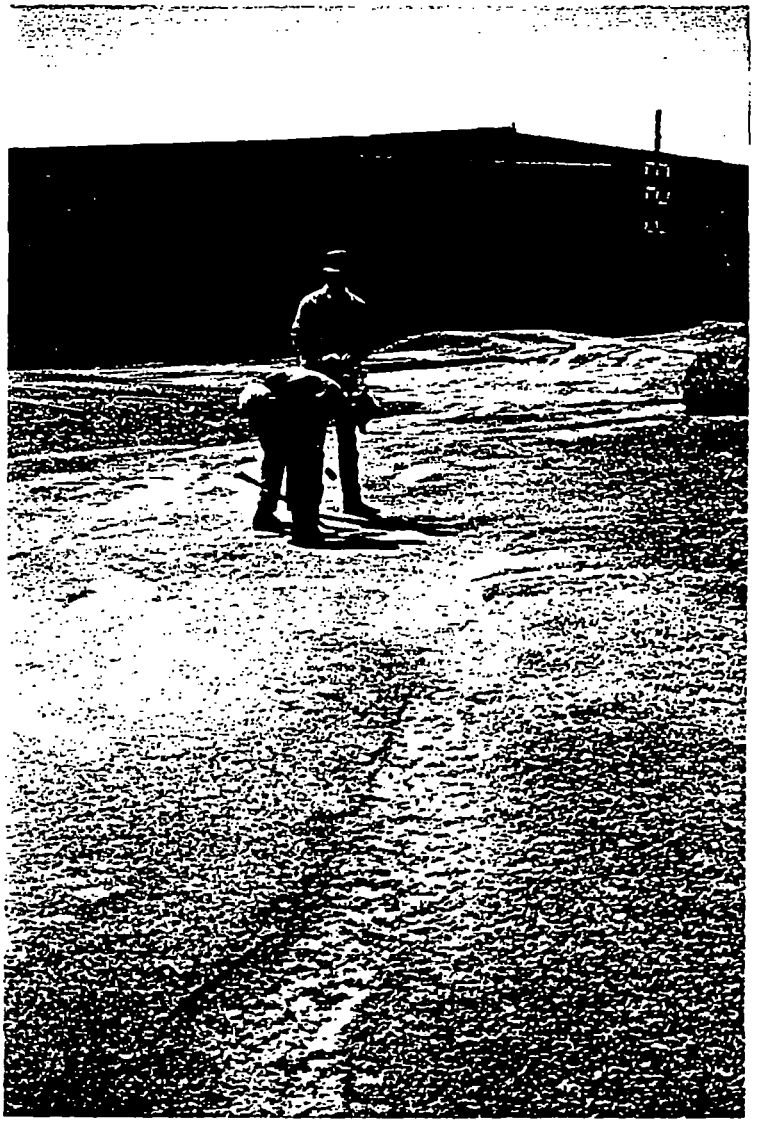
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

[PHT]9406-008.SK



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing east at stack from northeast corner of fertilizer building.
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: 1040 Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor



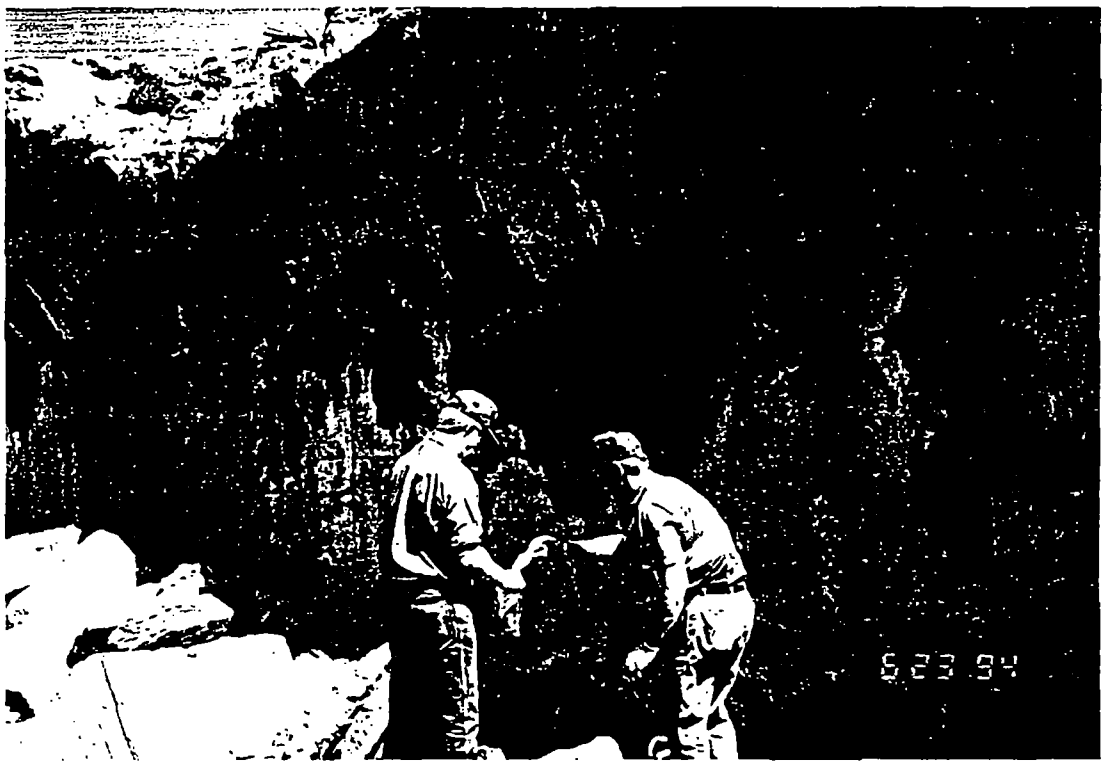
OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Sample location CC-SO-8. Note gray surface soil leading to warehouse.
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

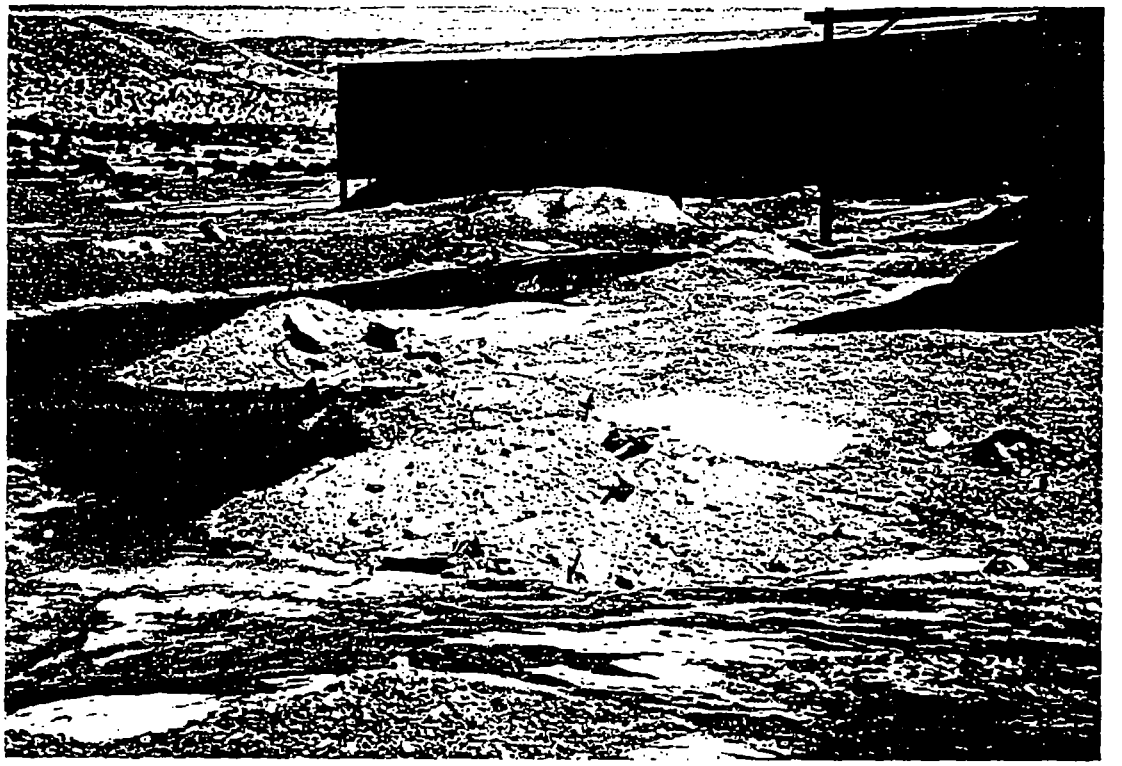
Subject: Facing east at remnants of flotation system.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Sample location CC-SO-11. Precipitate from the wall of the flotation structure.
Site: College of the Canvons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

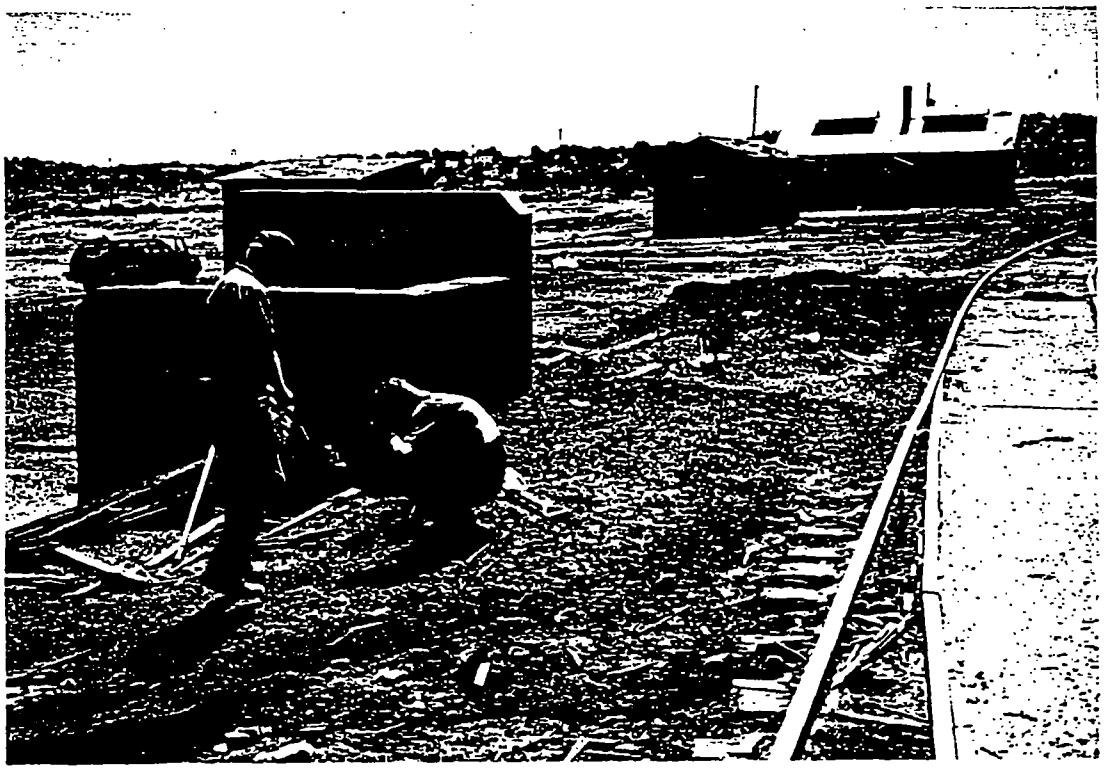
Subject: Ponded water on west side of fertilizer building.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

(PHT)9406-008.SK

OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing east at the remains of a concrete pad presumed to be the floor of a building.
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

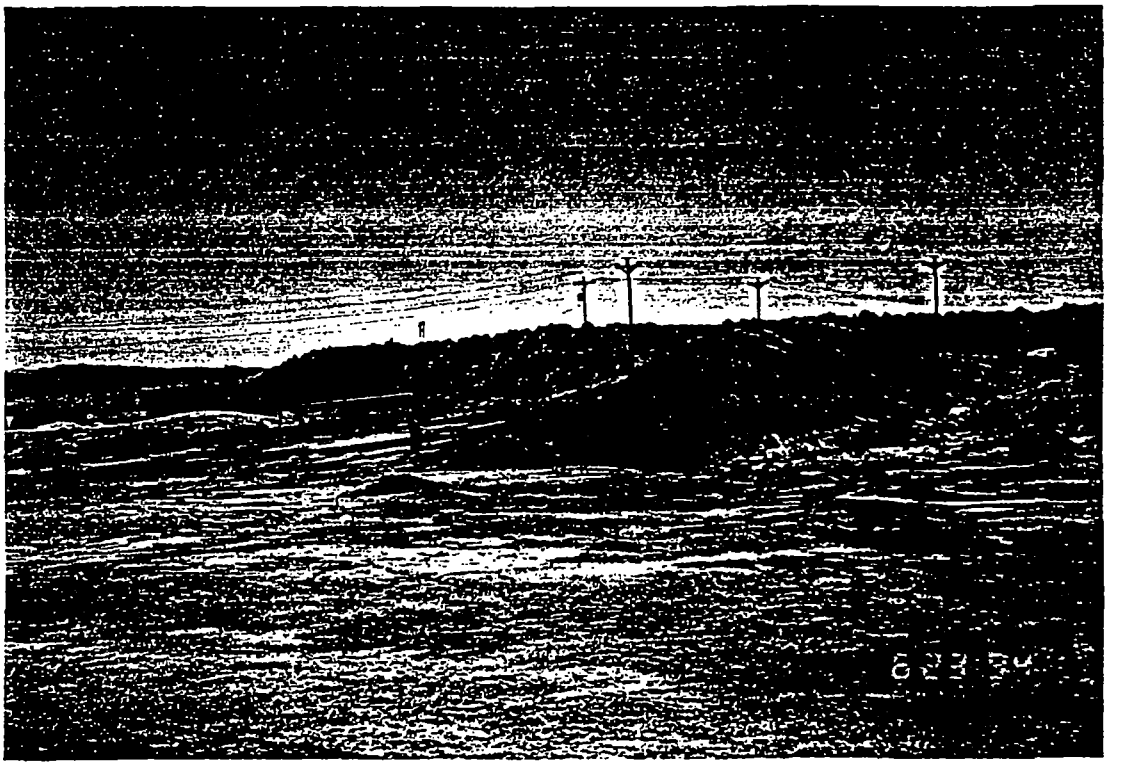


OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Sample location CC-SO-13 at northwest corner of concrete smelter pad.
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing north at smelter stack from the location of the background sample CC-SO-14, near Protec Corporation.
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: 1115 Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

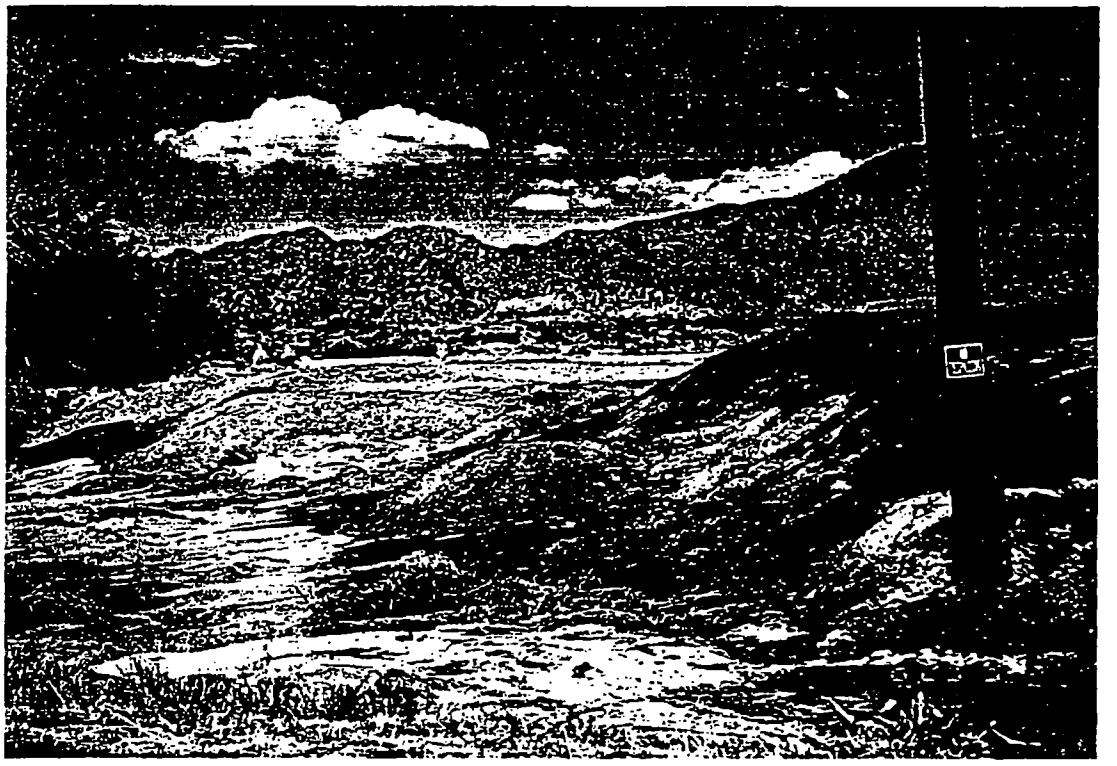


OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Mound identified as east waste pile by Ed Tezak.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

[PHTP9406-008.SK

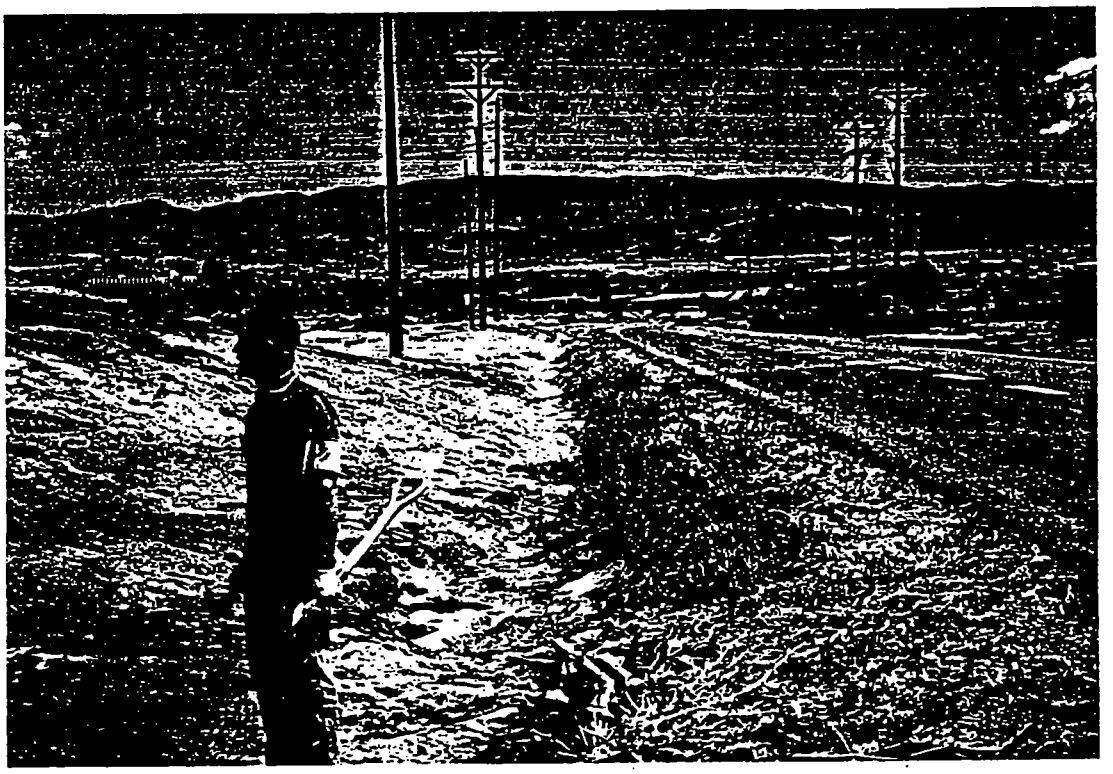


OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing west at West Waste Pile as identified by Ed Tezak.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

IPHT]9406-008.SK

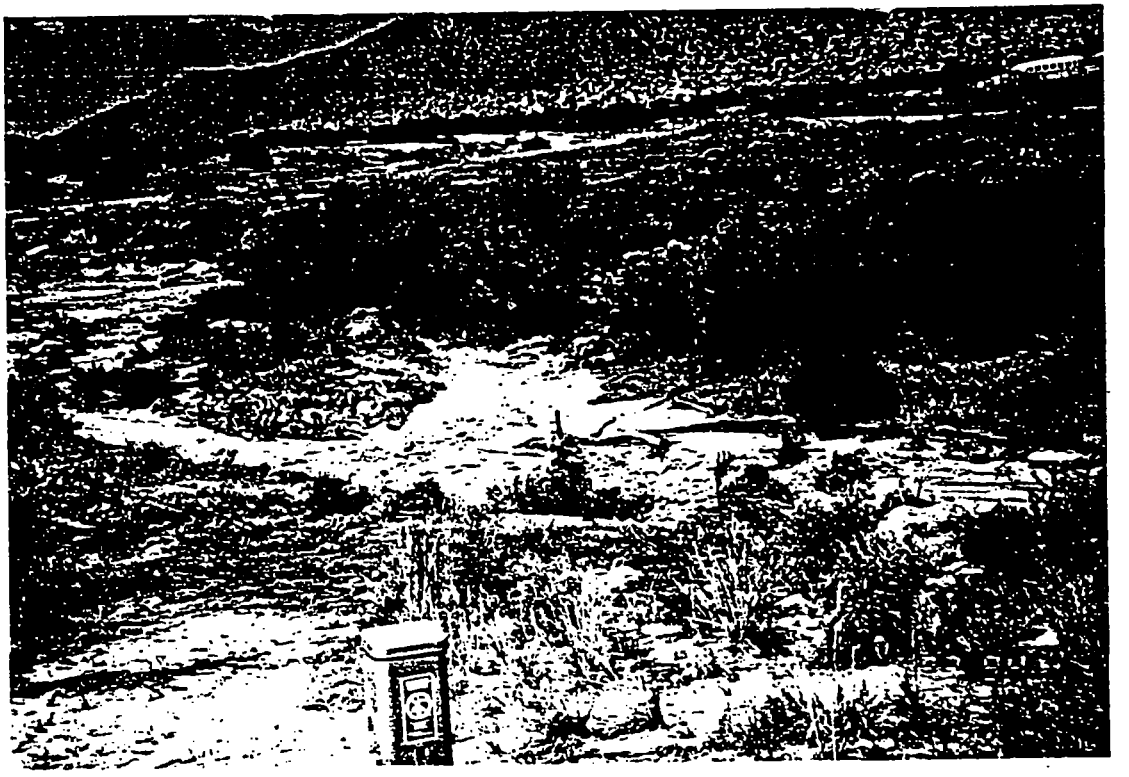


OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Facing north at drainage ditch along Forge Road.

Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

[PHTP9406-008.SK]



OFFICIAL PHOTOGRAPH
ENVIRONMENTAL PROTECTION AGENCY

Subject: Sample location CC-SO-17 near junction of Temple Canyon Road and Mariposa.
Site: College of the Canyons Smelter Site
City: Canon City County: Fremont State: CO
Date: June 23, 1994 Time: _____ Hours
Photographer: Scott Keen
Film: Kodak ASA: 200 Location of Negative: EPA-ERB
File: T08-9406-0008
Witness: Mike Zimmerman, EPA
Process: C-41
Paper: Fujicolor

(PHT)9406-008.SK

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER

Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

REFER TO

*For Wildlife–
For People*

Mr. Scott Keen
Ecology and Environment, Inc.
1776 South Jackson St.
Denver, Colorado 80210

July 7, 1994

RE: The New Jersey Zinc Co. Hazardous Waste Site in Canon City

Dear Scott:

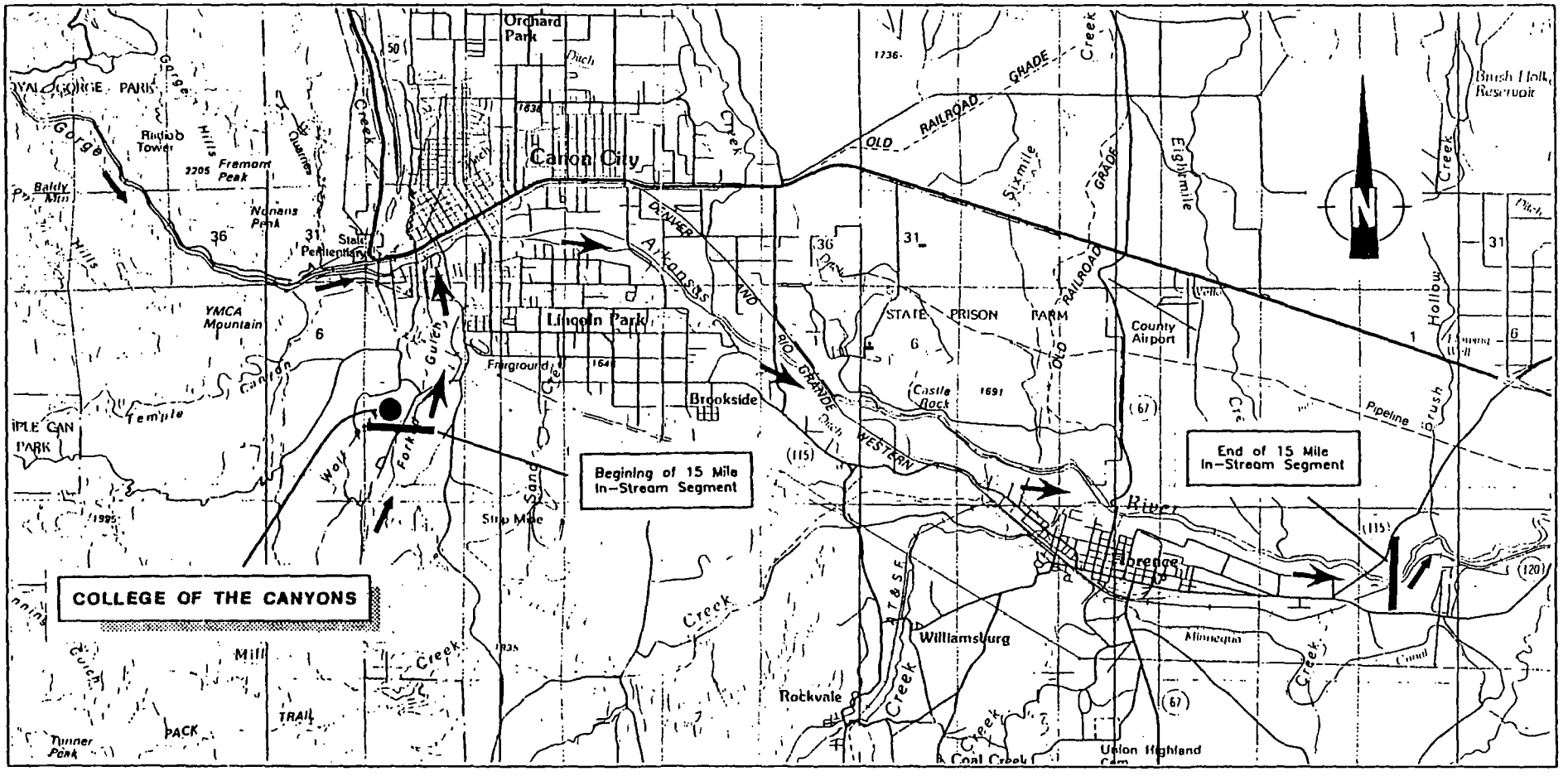
I enjoyed meeting with you and the opportunity to explore the New Jersey Zinc Co. site. As a result of reading the materials you provided and having examined the site in question (including pathways to the Arkansas River), I am submitting the following comments:

1. The site does appear to be a hazard, environmentally, by virtue of the high concentrations of heavy metals or chemicals of concern (COC's) in tailings and ore piles. These tailings and ore piles are unsuitable as wildlife habitat so few species are likely to be exposed on site. Sign indicates that coyote do transit the site, however.

2. The primary exposure of wildlife to the COC's probably results from wind born materials and from materials eroding into down-stream drainages following major storm events. My perception after following the drainages in question to the confluence with the Arkansas River is that there is a surprisingly direct surface water pathway from the site to the Arkansas. This pathway is enhanced by flowing waters in the drainage section that adjoins the residential area and flows beneath the irrigation canal.

3. Heavy precipitates and sediments along this pathway suggests that COC's are indeed entering the Arkansas.

4. No threatened or endangered species are likely to inhabit the site or to use it as a source of food. However, bald eagles do frequent the Arkansas River below Canon City, primarily during the winter. And, large concentrations of bald eagles gather in the Swallows area above Pueblo Reservoir. These eagles may feed up stream toward Canon City far enough to enter the 15 mile zone of concern. This may be true of resident osprey and great blue herons, also inhabiting the Swallows area.



0 1 2 3 4 MILES

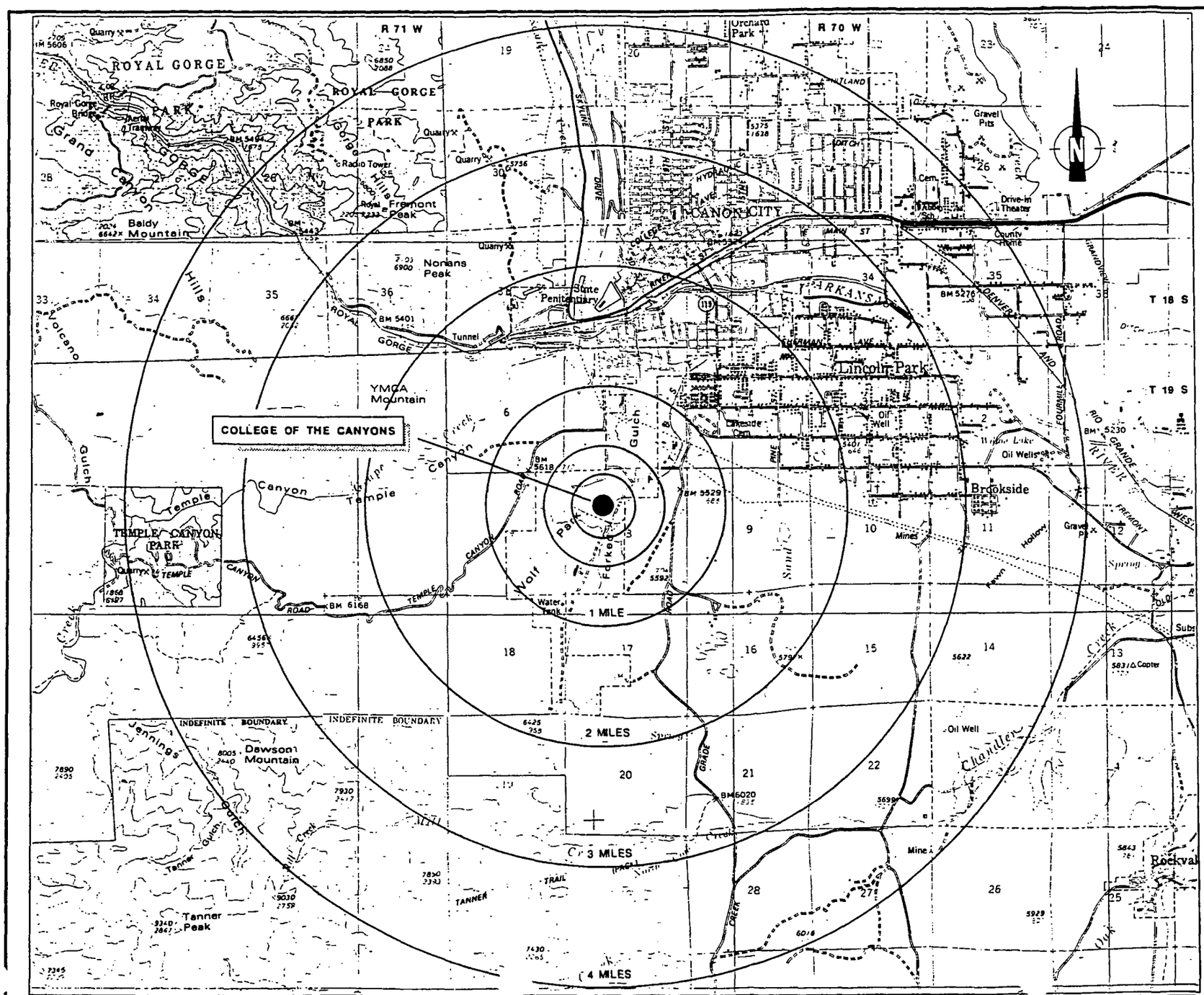
LEGEND

- Site location
- Flow direction

Source: Canon City Topographic Map, Colorado. USGS, 1982

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-WO-0037	
TITLE: COLLEGE OF THE CANYONS Canon City, Colorado 15 MILE DOWNGRADIENT STREAM SEGMENT	
T.D.D. T08-9406-0501	ZTCOLCA4
ecology & environment, inc. DENVER, COLORADO	FIG. 4
Date: 07/06/94 Drawn by: RSM Scale:	

Local Business	No. of Employees
Tezak Recycling & Waste Control Center 430 Forge Rd 275-0291	~~25~~ < 5
Fremont County Business Development Center 275-8601 Steve Madone	40
Portec Flowmaster Division 1 Forge Rd 275-7471	85
Portec Pathfinder Division 1610 Fry Ave. 269-1112	20
HMP Soldermatics 451 Valley Rd 275-1531	10
ESCOD Industries 275-7401 275-7595	80
Royal Gorge Fabricator 275-7702	6
Southwestern Moving and Storage 275-2391	5
Coltec Electronics	<5
Co. State Forest Service	<5
Fremont Auto Salvage	<5
BFH Transfer Station	<5
Indian Springs Auto Salvage	<5
Graves Electric	<5
DTS Industries	<5



LEGEND

● Site location

0 .5 1 2 MILES

Source: Fremont County Topographic Map, Colorado. USGS, 1980

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-WO-0037	
TITLE: COLLEGE OF THE CANYONS Canon City, Colorado RADIUS OF INFLUENCE MAP	
T.D.D. T08-9406-0501	ZTCOLCA4
ecology & environment, inc. DENVER, COLORADO	FIG. 3
Date: 07/08/94 Dr	by: RSM Scale:

COPY

SAMPLING QA/QC WORK PLAN
COLLEGE OF THE CANYONS SMELTER SITE
CANON CITY, COLORADO
TDD # T08-9406-0008

Prepared for:

U.S. Environmental Protection Agency
Region VIII, Denver, Colorado
Mike Zimmerman, On-Scene Coordinator
Pat Smith, Site Assessment Manager

Prepared by:

Ecology and Environment, Inc.
Technical Assistance Team
Scott Keen, Project Manager

Date Submitted: August 12, 1994

APPROVALS

Ecology and Environment, Inc.

Scott Keen — 8/12/94
Scott Keen, Project Manager — Date

Randy Perlis — 8/12/94
Randy Perlis, TAT Leader — Date

EPA

Mike Zimmerman — 8/12/94
Mike Zimmerman, On-Scene Coordinator — Date

P B Smith — 8/12/94
Pat Smith, Site Assessment Manager — Date

TABLE OF CONTENTS

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF TABLES

SAMPLING QA/QC WORK PLAN
COLLEGE OF THE CANYONS SMELTER SITE
CANON CITY, COLORADO
TDD #S T08-9406-0008 AND T08-9406-0501

1.0 INTRODUCTION

The Ecology and Environment, Inc., Technical Assistance Team (TAT) has been tasked by the U.S. Environmental Protection Agency (EPA) under Technical Direction Document (TDD) numbers T08-9406-0008and T08-9406-0501to conduct a site assessment of the College of the Canyons Smelter site in Canon City, Colorado. Proposed site assessment activities are designed to define immediate threats to human health or the environment and collect data suitable for input to the Hazard Ranking System (HRS).

2.0 SAMPLING EVENT OBJECTIVES

Specific objectives of proposed sampling activities at the College of the Canyons Smelter site include:

- characterization of site source(s)
- determination of immediate threats, actual impacts, or potential impacts to human health or the environment posed by on-site contaminants or by the migration of contaminants from the site; and
- collection of pathway-specific sampling data necessary for application of the Hazard Ranking System (HRS).

3.0 SITE INFORMATION

3.1 Site Location and Description

The College of the Canyons Smelter Site covers approximately 7 acres located 1 1/2 miles south of the Arkansas River in Canon City, Colorado. The site lies within Section 8, Township 19 South, Range 70 West, which is approximately 1 mile northwest of the Cotter Corporation National Priorities List site. Coordinates for the smelter stack, which

remains standing, are 38° 24' 43" North latitude, and 105° 14' 58" West longitude. Figure 1 is a site location map.

3.2 Directions to the Site

From State Highway 50 in Canon City, take the 1st Street Bridge south across the Arkansas River, where 1st street becomes Temple Canyon Road. Approximately 1 mile from the river, Temple Canyon Road turns west and Mariposa continues to the south. Mariposa Road dead ends near the northern boundary of the College of the Canyons Smelter site.

3.3 Site History

In 1902, the New Jersey Zinc Company completed construction of a smelter in Canon City, Colorado to recover zinc and lead concentrates from ores shipped from the Eagle Mine and Mill in Gilman, Colorado. The New Jersey Zinc facility was the second zinc smelter to be located in Canon City. The other facility, the American Zinc Lead Smelter, was located approximately 1 mile north of the New Jersey Zinc plant.

The New Jersey Zinc Smelter's original processing capacity was 50 tons per day. In 1920, significant process additions were made. Process operations peaked during the 1920s, at which time the smelter employed approximately 400 persons. The plant was closed in 1932, reopened just prior to World War II, and closed again in 1968. At the time of its final closure, the plant was processing approximately 90 tons per day.

In 1968, the New Jersey Zinc Company property in Canon City was purchased by the Canon Chemical Company. This company "reclaimed" the zinc plant waste materials by using these materials as soil additives. The purchase included approximately 60,000 tons of zinc plant tailings. As recently as 1991, waste materials from the site were being added to commercial soil conditioning products.

In May 1991, the Emergency Response Branch (ERB) of the EPA removed 155 drums from the site due to potential threats posed to the environment. At that time, contaminated soils, waste rock, and tailings from smelter activities were not addressed. In June 1994,

the EPA ERB and the TAT performed a reconnaissance survey of the smelter site, which included X-Ray fluorescence analyses of 17 soil samples. These analyses revealed elevated concentrations of several metals, including cadmium, lead, mercury, and zinc in most samples collected from on-site soils and waste piles.

4.0 PATHWAY ANALYSIS

4.1 Source Information

Contaminated soil, waste rock, and tailings appear to cover approximately 7 acres in the area of past zinc smelting activities. Figure 2 is a detailed site location map. Aerial photographs taken in 1971 after the final closure of the smelter show that waste materials may at one time have been consolidated over a smaller area. Recent site visits indicate that smelter wastes may have been spread out to some extent since the smelter ceased operations in 1968.

In June 1994, ERB and the TAT collected 17 soil samples for screening by X-ray fluorescence. No confirmation samples were submitted to a laboratory, and data from this sampling activity has not been validated; however, the purpose of this screening was simply to provide some understanding of potential contaminants of concern within on-site soils and waste materials. Many samples collected during this screening activity revealed elevated concentrations of chromium, nickel, copper, zinc, arsenic, mercury, lead, cadmium, and zinc. Zinc was detected at 21% in one sample; cadmium was detected as high as 2,067 mg/kg; lead as high as 53,000 mg/kg; and mercury as high as 206 mg/kg. Currently, the only estimate of source volume at the site is from a November 7, 1969 newspaper article that appeared in the Canon City Free Press. This article describes the purchase of the New Jersey Zinc Company's property by Canon Chemicals Company, and states that the purchase included an estimated 60,000 tons of zinc plant tailings.

4.2 Ground Water Pathway

Figure 3 illustrates the site and locations of domestic wells in the area of the site. Municipal drinking water supply is available in the areas to the north, south, and east of the site as shown in Figure 3. Shallow ground water from the site is believed to follow

local topography and move in a north/northeast direction following forked Gulch toward the Arkansas River. A domestic well in the northwest quarter of the northeast quarter of Section 5 (Figure 3), located at 215 East Highland Avenue, is the well closest to Forked Gulch and the one most likely to be impacted by contaminated shallow ground water. The property owner states, however, that this well is not used for drinking water and has not been used for any purpose since 1985.

Contaminated waste material at the site is believed to be highly acidic. Upon contact with rain water or snowmelt, metals will become soluble and can be transported into the ground. The acid-neutralizing capability of local soils will determine the extent to which metal contaminants will be transported from the site. If shallow ground water at the site has become contaminated, the probable pathway of interest would be the ground water to surface water pathway. It is possible that shallow ground water from the site would contact Forked Gulch and/or the Arkansas River; however, predicting the ability of metal contaminants to move with this shallow ground water is difficult without an in-depth understanding of local soils.

4.3 Surface Water Pathway

The College of the Canyons Smelter site is located approximately 1.5 miles south of the Arkansas River. Surface run-off from the site enters one of three drainage ditches as illustrated in Figure 1. These ditches are intermittently dry and appear to contain flow only during rainfall and snowmelt events. The ditches meet and join north of the site and east of the junction of Temple Canyon Road and Mariposa Road. From this point, the single channel moves toward the Arkansas River along the east side of the Greenwood Cemetery and parallels 2nd Street in Canon City. The final quarter-mile of this channel is lined with concrete. The channel enters the Arkansas River directly west of Centennial Park and downstream of the 1st Street Bridge. Even during the dry season, this channel contains water as it approaches the Arkansas River. The channel picks up flow at some point(s) between the junction of Temple Canyon and Mariposa Roads and the junction of Highland Avenue and 2nd Street.

It appears that surface water drainage pathways contain sediment that has been carried from upstream locations and deposited along all sections of the drainage from the site to

the Arkansas River. Although wetlands are not mapped along the drainage that leads to the Arkansas River, there are likely small areas that would be classified as wetlands in accordance with federal guidelines. The Arkansas River below the 1st Street Bridge to Pueblo Reservoir is designated by the Colorado Department of Public Health and Environment, Water Quality Control Section as Class I Primary Contact Recreation, Class I Cold Water Aquatic Life, suitable for agricultural use, and as a domestic water supply. The City of Florence, located approximately 11 miles downstream of the site, receives 50% of its 2 million gallons per day water supply from the Arkansas River. Between Canon City and Florence, the Arkansas River has a relatively confined channel with cobble substrate that is recognized as an excellent cold water fishery. Species of special concern to the Colorado Division of Wildlife (CDOW) that inhabit this portion of the river are the red-bellied dace and the brown trout. Below Florence, the Arkansas River channel broadens and is characterized by a "transition zone" fishery containing diverse species and large numbers of fish. Bald Eagles are common to the Arkansas River below Canon City primarily during the winter months when the birds gather in large numbers in the Swallows area above Pueblo Reservoir. These wintering eagles may feed upstream as far as Canon City. This may also be true of resident osprey and great blue herons, which inhabit the Swallows area. The Swallows area is on the Arkansas River approximately 30 miles downstream of the site.

The surface water pathway at the College of the Canyons Smelter site is important during site assessment activities because of what appears to be a very direct pathway for contaminant migration to the Arkansas River. There is indication that rainwater or snowmelt becomes acidic upon contact with on-site waste materials. Under acidic conditions, most metals will solubilize in run-off and are easily transported from the site. Sediment can also be transported along drainage pathways from the site to the river.

4.4 Air Pathway

The 7 acres of waste rock, tailings, and contaminated soils are essentially barren, i.e., little or no vegetative cover exists at the site. In addition, waste materials and soils include a very fine-grained component. These conditions would appear to readily permit airborne migration of contaminants from the site; however, dusty conditions were not noted on several TAT site visits conducted during very dry periods of the summer of 1994. Instead,

it appears that a "crust", possibly the result of metals reacting with rainwater to form oxides or sulfate salts, has developed over the surface of the waste material. This crust is easily broken. TAT and EPA personnel recall very dusty conditions existing during the 1991 drum removal at this location. At that time, there was a fertilizer business operating on site, and vehicle traffic and handling of the waste materials may have maintained very loose and dry soil conditions. Although dusty conditions may not be a current concern, they could easily recur.

Targets for airborne contaminants from the site include the nearest individual at the Fremont County Business Development Center, located less than 250 feet northeast of the site. The population within 1/2 mile of the site does not include any residences, but does include several small businesses.

4.5 Soil Exposure Pathway

There are no fences or other barriers restricting access to the site. Although the site is less than 1 mile from the Prospect Heights residential area of Canon City, it is somewhat isolated from this area by steep and irregular topography. There is evidence of some foot traffic through the site. It is unlikely that any threatened or endangered species inhabit the site or use it as a food source. There are no residences within 1/2 mile of the site. The greatest soil exposure concerns appear to be the unrestricted access, particularly along Forge and Mariposa Roads, and the potential use of this area by children, pedestrians, or recreational vehicles.

5.0 SCHEDULE OF ACTIVITIES

5.1 Schedule of Work

Site sampling activities will include characterization of contaminant sources and collection of air, surface water, sediment, and ground water samples. Surface water samples will be collected during and immediately after a rainfall event. The following is an anticipated schedule of activities for sampling activities and follow-up work:

Activity	Start Date	End Date
Air sampling	August 15, 1994	August 20, 1994
Source characterization, sediment sampling, ground water sampling	August 22, 1994	August 27, 1994
Rain event sampling	2 days required after a rain event is accurately forecast	
Laboratory analysis, data validations	August 22, 1994	October 7, 1994
Sampling activities report	August 15, 1994	September 9, 1994
Analytical results report	August 22, 1994	October 24, 1994

5.2 Project Organization and Responsibilities

EPA On-Scene Coordinator (OSC) Mike Zimmerman and Site Assessment Manager (SAM) Pat Smith will provide overall direction to Ecology and Environment, Inc., staff concerning project sampling needs, objectives, and schedules.

The Ecology and Environment, Inc., Project Manager, Scott Keen, is the primary contact with the OSC and SAM. The project manager is responsible for the development of work plans, project team organization, and supervision of all project tasks, including report preparation.

The following E & E personnel will work on this project:

Personnel	Responsibility
Scott Keen	Project Manager
Mike Sullivan	Air Sampler
Kent Alexander	XRF Operator/Sampler
D'Arcy Straub	Site Safety Officer/Sampler
Tony Amos	Sampler
Rich Mayer	Sampler

5.3 Sampling

5.3.1 Sampling Design

Source Characterization

To characterize on-site waste sources, up to 50 samples will be collected and analyzed on site by X-ray fluorescence (XRF) for quantification of 25 metals. Samples will be collected from the surface to a depth of 2 feet below ground surface (bgs). Sample locations will be distributed over the entire 7-acre site. Although there are no obvious distinctions between on-site waste sources, there are three general areas of special interest within the 7-acre site, as follows: 1) the area of the tailings pond in the northeast section of the site; 2) the area of waste piles and the fertilizer building in the western section of the site; and the area near the smelter building, railroad tracks, and stack in the southeast section of the site. At least 10 samples from each of these three areas, and at least three background soil samples collected from south of the site will be analyzed by XRF. Between 8 and 12 samples analyzed by XRF for source characterization or as background samples will also be submitted to a laboratory for total metals analysis. A portion of samples submitted to the lab will also be analyzed for cyanide.

Sediment

There are three ditches that carry run-off from the site. These ditches are dry in the summer except during and immediately after rainfall events. The three ditches meet and join approximately 1/3 mile north of the site, and the resulting single ditch travels approximately 1 mile before entering the Arkansas River. This work plan is proposing the collection and analysis by XRF of up to 50 sediment samples collected from within the drainage leading from the site to the Arkansas River. Samples will be collected from surface sediments to a depth of 2 to 3 feet bgs. Between 8 and 16 samples analyzed on-site by XRF will also be submitted to a laboratory for total metals analysis. Approximate sediment sample locations are shown on Figure 2A. Sediment samples will be analyzed for total metals and cyanide.

Air Sampling

Seven sample locations will be established as illustrated on Figure 4. Air sample locations have been selected to test for a contaminant release to the air pathway and examine impacts at 0 to 1/4 mile, 1/4 to 1/2 mile, and 1/2 to one mile from the site. The Remedial Investigation/Feasibility Study conducted for the nearby Cotter Corporation NPL site indicates the predominant wind direction in this area of Canon City is from southeast to northwest. Hi-volume air samplers will collect five consecutive 24-hour samples. A meteorological station will operate concurrently to establish wind speed, direction, barometric pressure, temperature, and humidity at the site during the times of sample collection. This meteorological data will be used to establish a site wind rose, correlate sample results, and determine the background sample. Particulate matter collected on cellulose filters during sampling will be analyzed for total metals.

Surface Water/Storm Run-Off Sampling

This sampling will be conducted to determine if the release of metal contaminants to the Arkansas River occurs during a rain event and to determine potential impacts to sensitive environments. Surface water run-off samples will be collected from the drainage pathways leaving the site and entering the Arkansas River. Samples will be taken for background purposes from the drainages upgradient to the site. Specific sample locations will be chosen based on field observations. Sample locations and times of sample collection will be closely documented. All surface water/storm run-off samples will be submitted to a laboratory for metals analysis. Samples will be examined for total and dissolved metals as outlined in Table 1. Approximate surface water sample locations are shown on Figure 2A.

5.3.2 Sampling Methods and Equipment

All sampling will be conducted in accordance with the *Emergency Response Branch, Region VIII, Quality Assurance Project Plan*, dated January 1990.

Sediment and soil samples will be collected with dedicated Teflon scoops and placed directly into appropriate sample containers.

Air samples will be collected at a minimum flow rate of 40 cubic feet per minute on pre-weighed cellulose filters. Filters will be digested in accordance with EPA SW-846, Method 3050 prior to analysis for total metals. Surface water samples will be collected directly into the sample containers. Filtration for dissolved metals determination will occur through a 0.45 micron in-line filter using a peristaltic pump. A new filter and new tubing will be used for processing each sample. Any fitting within the filter apparatus that contacts sample will be decontaminated if it is to be reused on another sample. A minimum of 500 milliliters of sample will be pumped through the filter and discarded before sample is collected from the filter apparatus. All aqueous samples for metals analysis will be preserved with nitric acid. Analytes and detection limits for soil, sediment, air, and water samples are presented in Table 4. Note that all aqueous, soil or sediment, and air samples will be analyzed for total metals. A portion of aqueous samples will be analyzed for dissolved metals. A portion of soil and sediment samples will also be analyzed for cyanide.

5.3.3 Sample Handling and Shipment

All containers holding samples for laboratory analysis will be sealed and labeled. Labeled information will include site name and sample number, time and date of collection, analysis requested, and preservative used. Bottles will be placed in individual sample bags and shipped in metal or plastic coolers padded with vermiculite.

All sample documents will be affixed to the underside of each cooler lid. Custody seals will be affixed to two sides of the lid. Samples will be handled in accordance with chain-of-custody protocol described in the *NEIC Procedures Manual for the Evidenced Audit of Enforcement Investigation by Contractor Evidence Audit Teams*, dated April 1984 (EPA-300/9-81-003R).

5.3.4 Field Quality Assurance/Quality Control (QA/QC)

All samples will be collected, handled, and preserved in accordance with procedures established by the *Emergency Response Branch, Region VIII, Quality Assurance Project Plan*. QA/QC samples to be collected for laboratory analysis during proposed sampling activities include the following:

Air

- All samples (5) at one sample location will be duplicated and submitted to the lab as "blind" duplicate samples.
- Three clean filter blanks will be submitted to the lab for analysis.
- Three clean filters will be submitted for laboratory matrix spike and matrix spike duplicate analysis.

Soil and Sediment

- Two samples (1 per 20) will be collected in triple volume for laboratory matrix spike an matrix spike duplicate analsis.

Surface Water

- Two samples will be collected in duplicate and submitted to the lab as "blind" duplicate samples. One of these two samples will be an unfiltered sample; one will be a filtered sample.
- Two samples will be collected in triple volume and submitted to the lab for laboratory internal QA/QC procedures. One of these two samples will be an unfiltered sample; one will be a filtered sample.
- Two deionized, metals-free water blank samples will be submitted for laboratory analysis to check integrity/cleanliness of containers, preservative, and filter apparatus.

5.3.5 Site Safety and Access

An exclusion zone and personnel decontamination station (PDS) will be established during the site assessment. The extent and location of the PDS will be determined in the field based on site conditions and prevailing meteorological conditions. It is expected that most site-related field activities can be accomplished in Level D personal protection. Personal protection levels will be upgraded to Level C if site conditions and/or air monitoring warrant such an upgrade. All field activities will be conducted in strict accordance with an approved site safety plan.

The Region VIII EPA/ERB will seek permission for access to properties prior to sampling activities.

5.3.6 Management of Investigation-Derived Waste (IDW)

Management of IDW generated during this proposed work will be handled in accordance with EPA guidance document, *Management of Investigation-Derived Wastes During Site Inspections*, (EPA/540/G-91/009, May 1991). The field team will be prepared to contain any material that may be contaminated.

6.0 DELIVERABLES

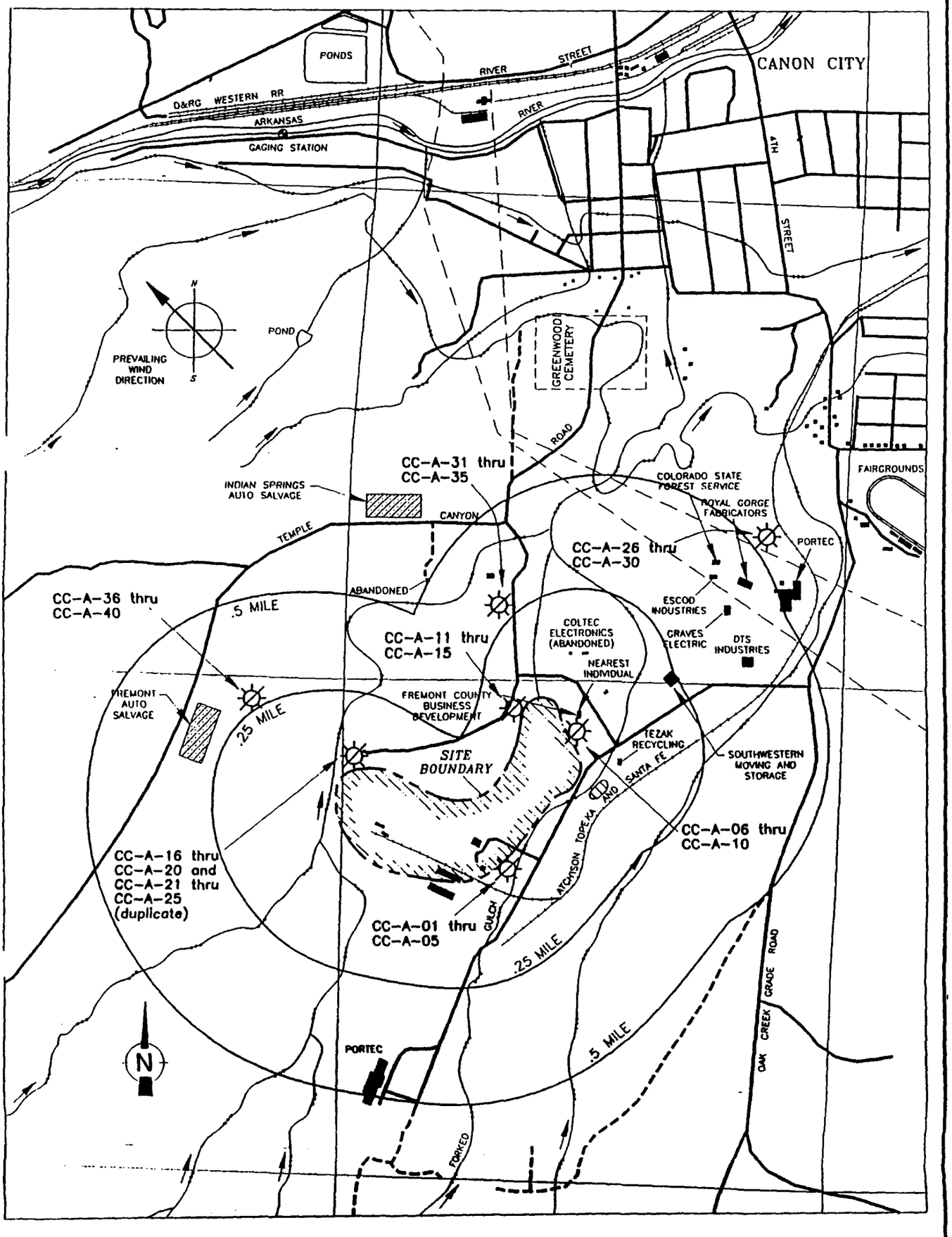
The Ecology and Environment, Inc., Project Manager, Scott Keen, will maintain contact with the OSC and SAM to keep them informed of the technical and financial progress of this project. This communication will begin when the work assigned is issued. Activities under this project will be reported in a sampling activities report (SAR) and an analytical results report (ARR) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

6.1 Sampling Activities Report

An SAR will be prepared to provide a detailed accounting of what occurred during each sampling activity. The SAR will be prepared within two weeks of the last day of sampling. Information will be provided on time of major events, dates, and personnel on site (including affiliations). The SAR will be organized into four major sections: Introduction, Background,, Activities, and Observations. Appropriate maps, tables, and figures will be included in the SAR.

6.2 Analytical Results Report

An ARR will be prepared for samples analyzed under this plan. It will be submitted within three weeks of receipt of validated data.



0 1000 2000 3000

SCALE : FEET

LEGEND

Air sample location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

TITLE:

COLLEGE OF THE CANYONS
Canon City, Colorado

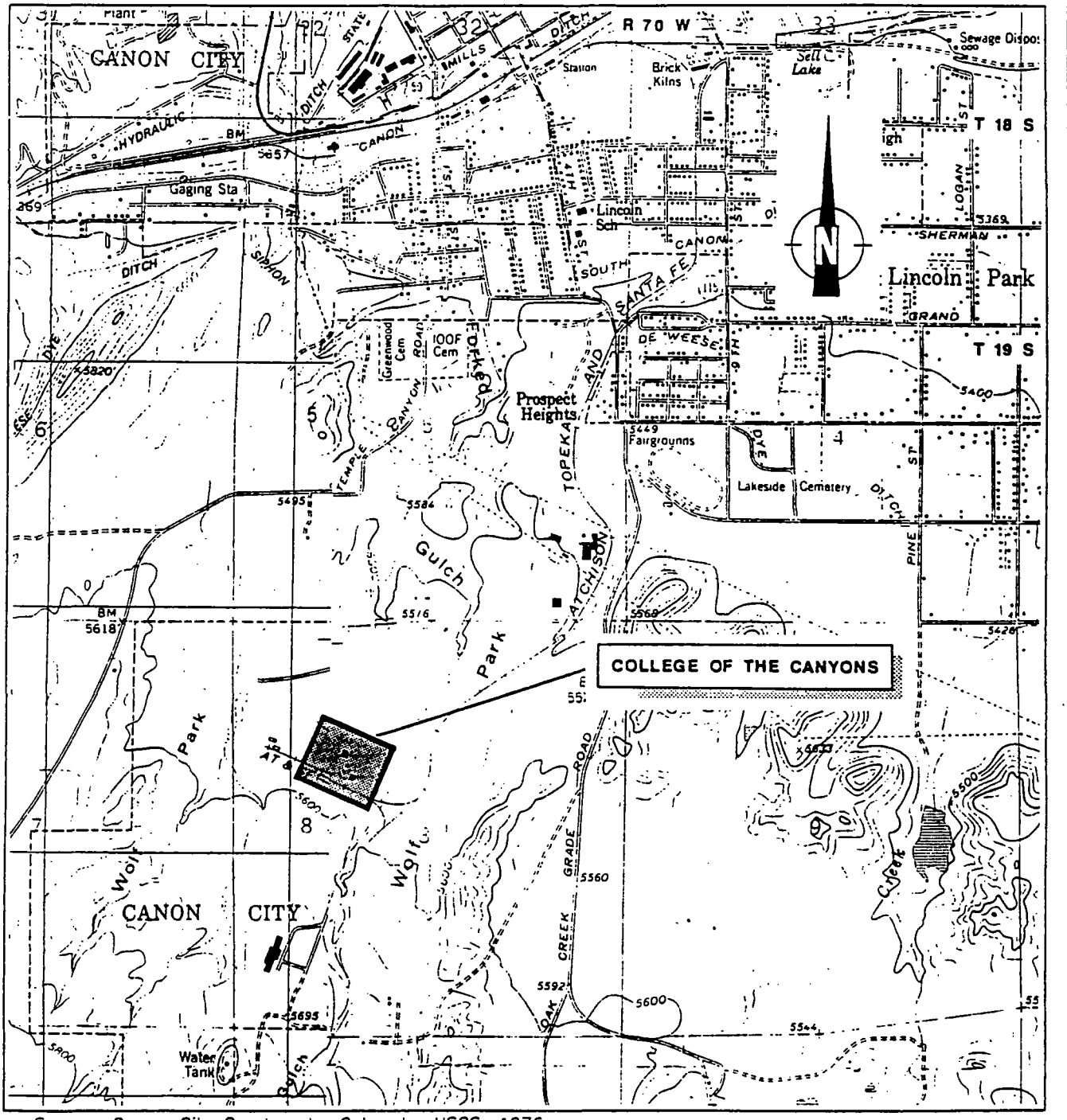
PROPOSED AIR SAMPLE LOCATION MAP

T.D.D. T08-9406-0501 ZTCOLCA5

ecology & environment, inc.
DENVER, COLORADO

FIG. 4

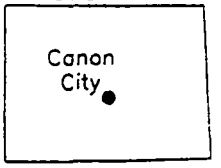
Date: 07/12/94 Drawn by: RSM Scale:



Source: Canon City Quadrangle, Colorado. USGS, 1976

0 1/2 1 MILE

LOCATION MAP
COLORADO



LEGEND

Site location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

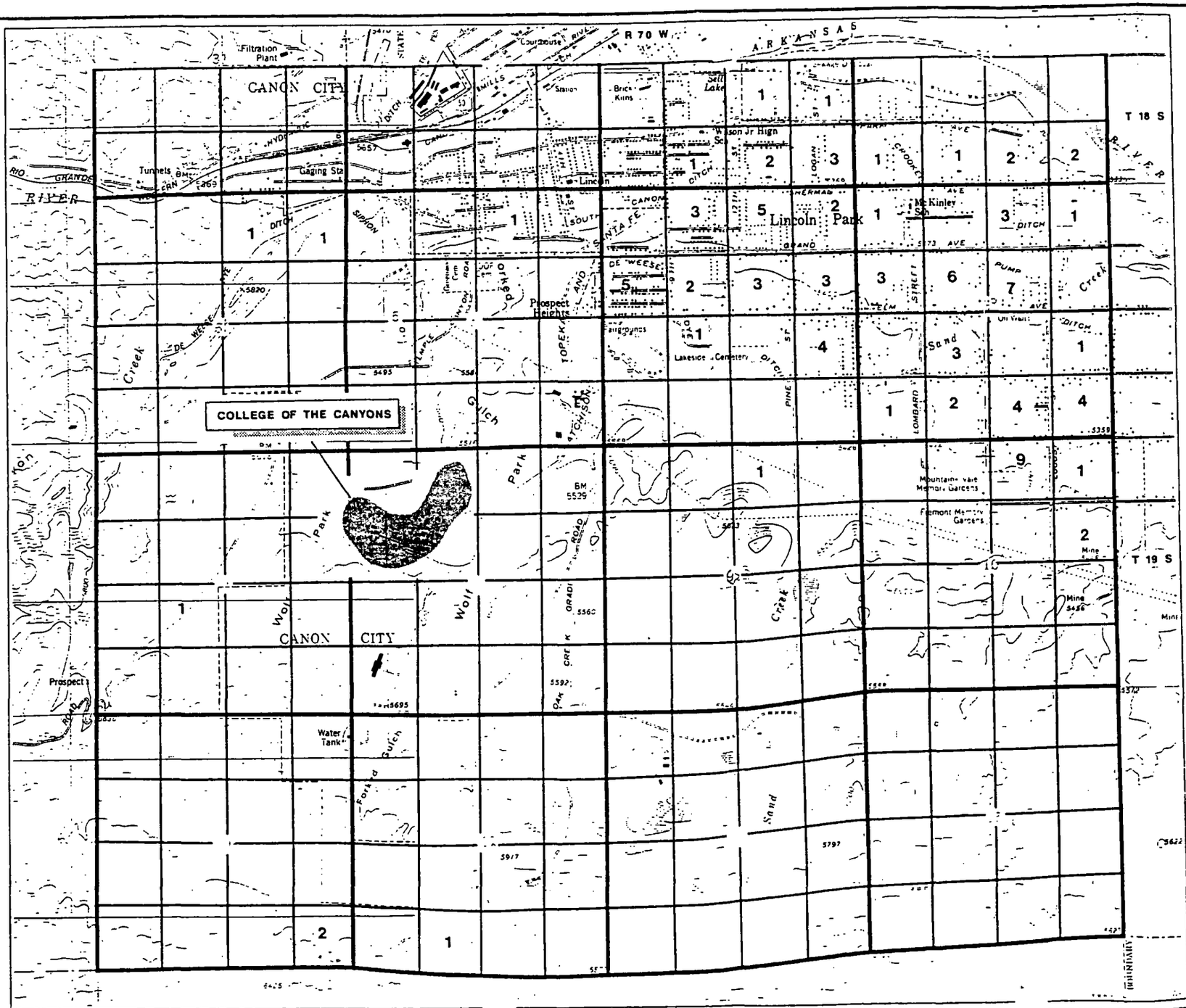
TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
SITE LOCATION MAP

T.D.D. T08-9406-0501 ZTCOLCAN

ecology & environment, inc.
DENVER, COLORADO

FIG. 1

Date: 07/06/94 Drawn by: RSM Scale: _____



LEGEND

5 Denotes number of domestic well applications and permits

N

0 1/2 1 MILE

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

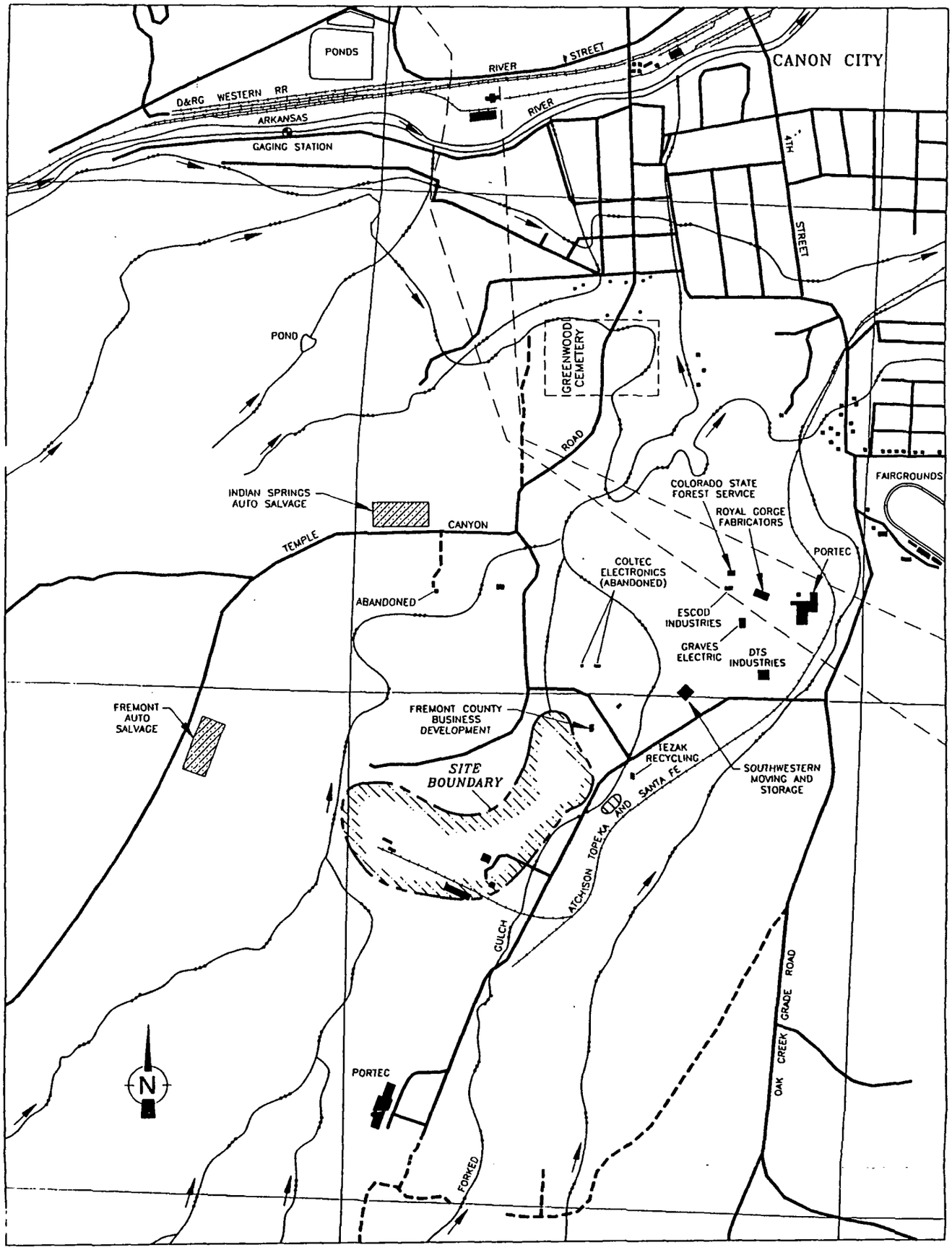
TITLE: COLLEGE OF THE CANYONS
Canon City, Colorado
DOMESTIC WELL APPLICATIONS AND PERMITS LOCATION MAP

T.D.D. T08-9406-0501 ZTCOLCA6

ecology & environment, inc.
DENVER, COLORADO

FIG. 3

Date: 07/28/94 Drawn by: RSM Scale:



0 1000 2000 3000

SCALE : FEET

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado

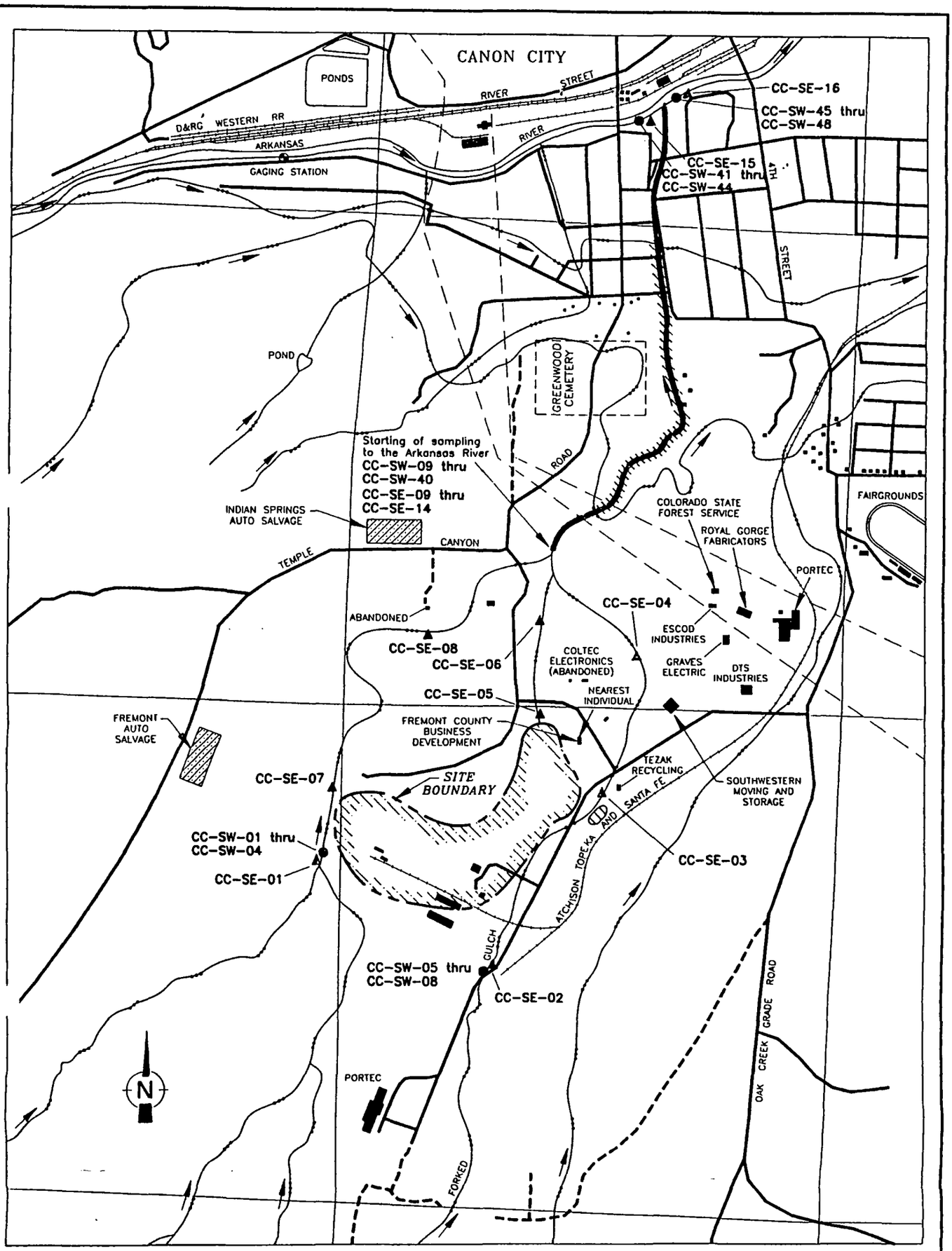
DETAILED SITE LOCATION MAP

T.D.D. T08-9406-0501 ZTCOLCA5

ecology & environment, inc.
DENVER, COLORADO

FIG. 2

Date: 07/12/94 Drawn by: RSM Scale:



0 1000 2000 3000

SCALE : FEET

LEGEND

- ● Surface water sample location
- ▲ Sediment sample location
- \\\\ Potential wetlands area

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

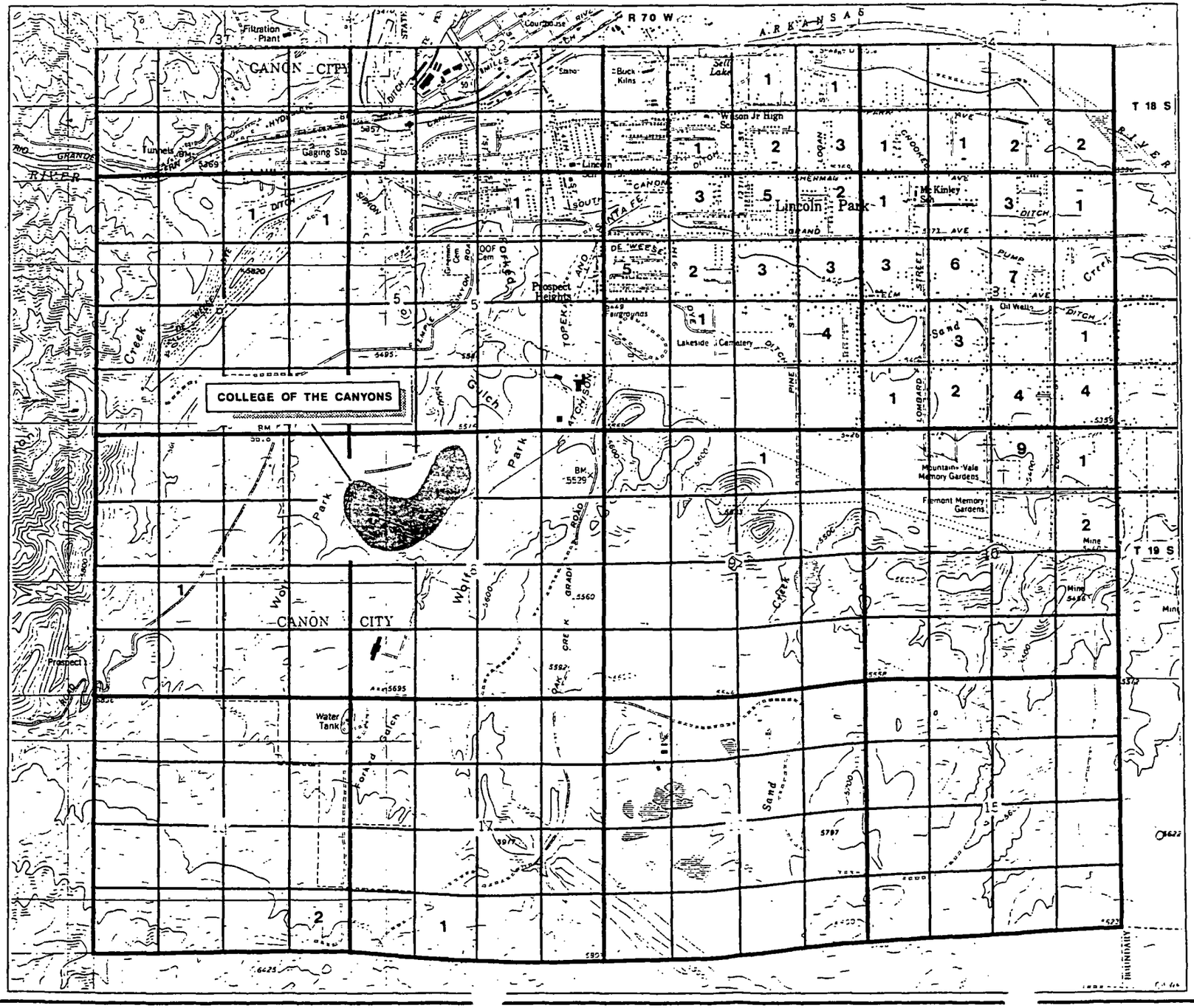
TITLE:
COLLEGE OF THE CANYONS
Canon City, Colorado
APPROXIMATE SURFACE WATER/SEDIMENT SAMPLE LOCATION MAP

T.O.D. T08-9406-0501 ZTCOLCA5

ecology & environment, inc.
DENVER, COLORADO

FIG. 2A

Date: 08/12/94 Drawn by: RSM Scale:



LEGEND

5 Denotes number of domestic well applications and permits

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

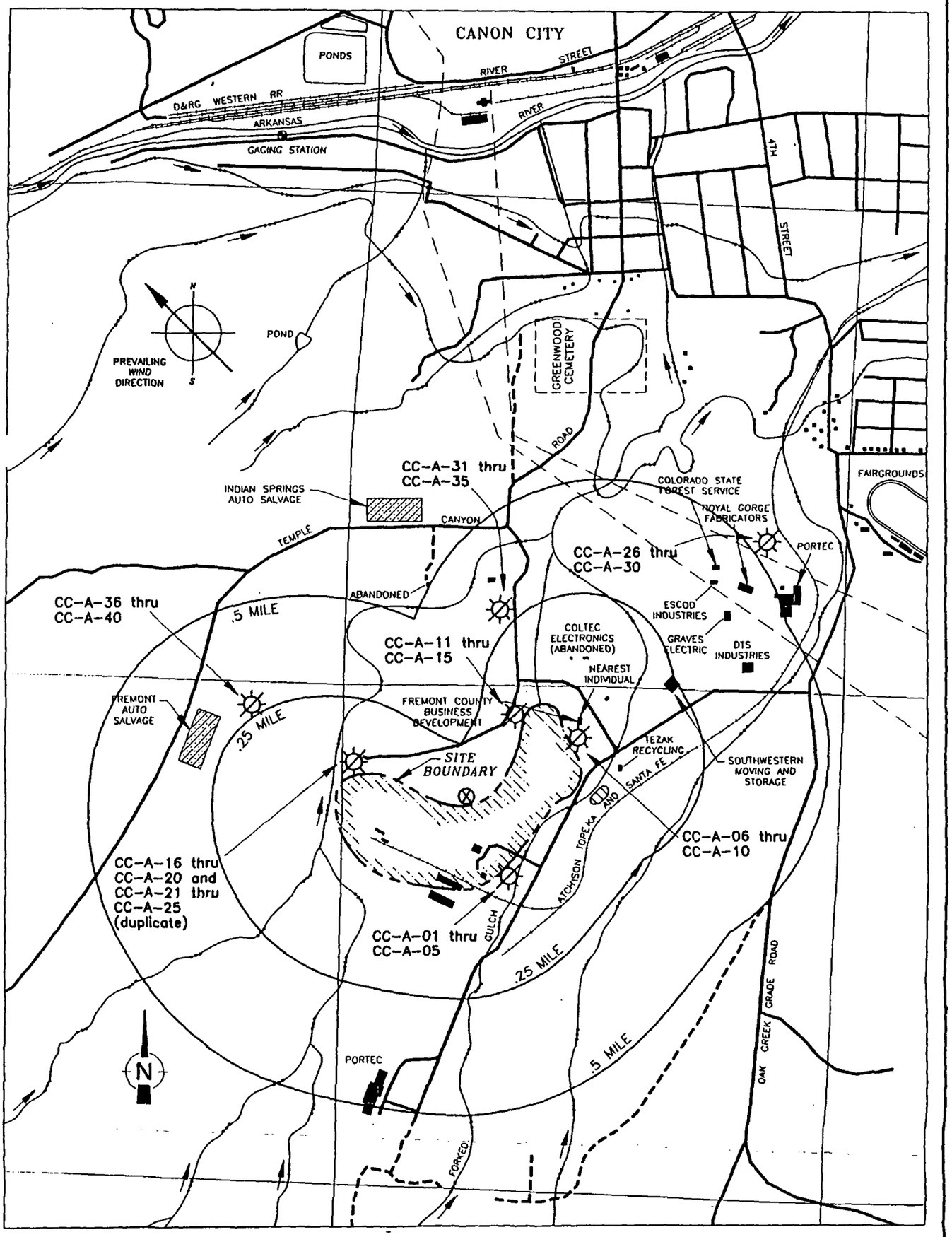
TITLE: COLLEGE OF THE CANYONS
Canon City, Colorado
DOMESTIC WELL APPLICATIONS AND PERMITS LOCATION MAP

T.D.D. T08-9406-0501 ZTCOLCA6

ecology & environment, inc.
DENVER, COLORADO

FIG. 3

Date: 07/28/94 Drawn b[illegible]SM Scale:



0 1000 2000 3000

SCALE : FEET

LEGEND

Air sample location

Met. station

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-WO-0037	
TITLE: COLLEGE OF THE CANYONS Canon City, Colorado PROPOSED AIR SAMPLE LOCATION MAP	
T.D.D. T08-9406-0501	ZTCOLCA5
ecology & environment, inc. DENVER, COLORADO	FIG. 4
Date: 08/12/94 Drawn by: RSM Scale:	

TABLE 1
SAMPLE TYPES, LOCATIONS, AND RATIONALE
COLLEGE OF THE CANYONS SMELTER SITE, CANON CITY, COLORADO
TDD NO. T08-9406-0008

SAMPLE MATRIX	SAMPLE NOS.	SAMPLE LOCATION	RATIONALE
Air	CC-A-01 thru CC-A-05	College of the Canyons property, immediately southeast of area of suspected contamination	Assess release of contaminants and determine potential impacts to workers.
	CC-A-06 thru CC-A-10	Fremont County Business Development property, immediately northeast of area of suspected contamination.	Assess release of contaminants and determine potential impacts to workers.
	CC-A-11 thru CC-A-15	TRC property, immediately north of area of suspected contamination.	Assess release of contaminants and determine potential impacts to workers.
	CC-A-16 thru CC-A-20	TRC property, immediately northwest of area of suspected contamination.	Assess release of contaminants and determine potential impacts to workers.
	CC-A-21 thru CC-A-25	Duplicates of CC-A-16 thru CC-A-20	Check of sample collection and analyses.
	CC-A-26 thru CC-A-30	Beyond 1/2 mile northeast of site in the direction of nearest residential neighborhood	Assess release of contaminants and determine potential impacts to residents.
	CC-A-31 thru CC-A-35	BFH Transfer/Recycle Station, beyond 1/4 mile north of site.	Assess release of contaminants and determine potential impacts to workers.
	CC-A-36 thru CC-A-40	Fremont Auto Salvage property, beyond 1/4 mile west/northwest of site.	Assess release of contaminants and determine potential impacts to workers.
	CC-A-41 thru CC-A-45	Filter blanks	Check on filter, handling and lab QA/QC.
	CC-A-46 thru CC-A-48	Filter blanks.	Lab matrix spike and matrix spike duplicate analysis.
Soil	CC-So-01 and CC-SO-02	*Background soil samples collected south of the site.	Provide background soil characterization.
	CC-SO-03 thru CC-SO-12	*Soil samples from on-site waste sources. Includes one triple volume sample.	Characterize source.
Sediment	CC-SE-01 and CC-SE-02	*Sediment samples from site drainage ditches, upgradient, south of the site.	Provide background sediment characterization.
	CC-SE-03 and CC-SE-04	*From drainage ditch on east side of site.	Assess release of contaminants.
	CC-SE-05 and CC-SE-06	*From drainage ditch which exits tailings pond area.	Assess release of contaminants.
	CC-SE-07 and CC-SE-08	*From drainage ditch on west side of site.	Assess release of contaminants.
	CC-SE-09 thru CC-SE-14	*From Forked Gulch where three drainage ditches meet to the Arkansas River. Includes one triple volume sample.	Assess release of contaminants and determine potential impacts to sensitive environments.
	CC-SE-15 and CC-SE-16	From upstream and downstream in Arkansas River at confluence with Forked Gulch.	Assess release of contaminants and determine impacts to sensitive environments. + fishery
Surface Water	CC-SW-01 thru CC-SW-08	*Surface water runoff samples collected from drainage ditches along east and west sides of the site, upgradient, south of the site.	Provide background surface water runoff characterizations.
	CC-SW-09 thru CC-SW-40	*Surface water runoff samples collected from drainage ditches adjacent to the site and downgradient along Forked Gulch to the Arkansas River. Includes blind duplicate samples and at least two samples collected in triple volume for laboratory QA/QC purposes.	Assess release of contaminants and determine impacts to sensitive environments.
	CC-SW-41 thru CC-SW-48	From upstream and downstream in Arkansas River at confluence with Forked Gulch.	Assess release of contaminants and determine impacts to sensitive environments.
	CC-SW-49	Deionized metals-free water blank.	Check of container and preservative cleanliness.
	CC-SW-50	Field filtered deionized, metals-free water blank.	Check of filter apparatus and procedure.

*Precise sample locations will be determined in the field based on observations made by field personnel. Sample locations will be recorded at the time of sample collection.

TABLE 2
NON-SAMPLING DATA COLLECTION OBJECTIVES
COLLEGE OF THE CANYONS SMELTER SITE, CANON CITY, COLORADO
TDD NOS. T08-9406-0008 AND T08-9406-0501

Waste Characteristics

- Identify and photograph source areas and features.
- Measure source areas.
- Using XRF screening analysis, determine significant differences in contaminant concentrations within different areas of the site.

Ground Water Pathway

- Look for ground water seeps to surface water along Forked Gulch between the site and the Arkansas River.

Surface Water Pathway

- Observe drainage area topography and determine site run-off patterns and other possible contaminant sources entering the Forked Gulch drainage between the site and the river.
- Locate and quantify wetlands along Forked Gulch between the site and the Arkansas River.

Air Pathway

- Record and observe any visible particulate migration.

Soil Exposure Pathway

- Document site accessibility and use.

TABLE 3
SAMPLE PRESERVATION AND BOTTLE REQUIREMENTS
COLLEGE OF THE CANYONS SMELTER SITE, CANON CITY, COLORADO
TDD NOS. T08-9406-0008 AND T08-9406-0501

LOW CONCENTRATION SAMPLES	
Inorganics	
Metals (Water)	One 1-liter poly, filtered, then nitric acid to pH < 2
Metals (Solid)	One 8-oz glass jar
Metals (Air)	Cellulose filters individually contained in Ziploc bags.

TABLE 4
INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Detection Limit (µg/L - Water[1])
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

[1] Sediment and soil detection limit 100x water. Detection limits in soil and sediment are corrected depending on the sample's moisture content. Air sample detection limit 250x water and expressed as µg/filter.

Source: Ecology and Environment, Inc., based on the Contract Laboratory Program Statement of Work, ILM02.1 (9/91).